HAZARDOUS WASTE DISPOSAL

HEARINGS

BEFORE THE

SUBCOMMITTEE ON
INVESTIGATIONS AND OVERSIGHT

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

MARCH 30; MAY 4, 1983

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U.S. GOVERNMENT PRINTING OFFICE
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HAZARDOUS WASTE DISPOSAL

WEDNESDAY, MARCH 30, 1983

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
Washington, D.C.

The subcommittee met, pursuant to call, at 10 a.m., U.S. Post Office/Federal Building, Jackson, Tenn., Hon. Albert Gore (chairman of the subcommittee) presiding.

Present: Representatives Gore, Durbin and Ed Jones.

Mr. GORE. The subcommittee will come to order. I would like to welcome our guests and our witnesses.

I have an opening statement and Congressman Ed Jones will have an opening statement. Congressman Richard Durbin of Illinois is on his way here from the airport, but because of the lengthy witness list and the fact that we will be going for many hours, I feel it is best to go ahead and start the hearing even as Congressman Durbin is on his way here.

Since the tragedy of Love Canal first came to the attention of the American public 6 years ago, our Nation has learned a great deal about the current problems that indiscriminate disposal of hazardous waste can bring.

Tennesseans are not strangers to these problems. The Hollywood dump in Memphis and the Velsicol landfill in Hardeman County are examples familiar, not only in Tennessee, but nationally.

Indeed, in the first congressional hearing ever held on hazardous chemical waste, the two examples explored and investigated were Hardeman County, Tenn., and Love Canal.

We now recognize that a good deal of the precious drinking water supply of this country in underground aquifers has been put in jeopardy by irresponsible disposal practices, and we are beginning to understand the enormous threat presented by the dumping of toxic wastes in unprotected landfills.

According to a recent report of the Congressional Office of Technology Assessment, approximately 250 million metric tons—or 500 billion pounds—of hazardous chemical wastes are generated annually in this country. That is over 1 metric ton of waste for every man, woman, and child in America.

Tennessee, which is the sixth largest generator of waste in the country, according to the OTA figures, produces nearly 4.3 million metric tons—or almost 9 billion pounds—of hazardous waste. That, too, represents nearly 1 ton of waste for every man, woman, and child in the State of Tennessee.

Between 80 and 90 percent of the waste produced nationally is dumped into landfills. This waste is clearly a ticking time bomb waiting to explode sometime in the future. The great concern over the problems caused by the widespread dumping of highly toxic wastes in the landfills has spurred efforts to try to make landfills safer. New technology is now being developed that will provide an added degree of protection in landfills—at least greater protection than that provided when wastes are dumped directly into unlined pits, quarries, and lagoons.

But the efforts to improve landfill technology, while laudable, ignore the fundamental issue that is really at stake here. The question is not how we can improve our landfills, but rather should we be using landfills for highly toxic and extraordinarily persistent wastes in the first place? I believe the answer is that we should not. The best scientific evidence now available indicates that no landfill can be made safe from all substances under all conditions.

A landfill liner might be impermeable for some wastes, but other wastes may move through it easily. Moreover, the long term security of any landfill cannot be guaranteed, even for those substances that the landfill might successfully restrain in the short term. Indeed, present EPA regulations require that a landfill be secure for just 30 years. The National Academy of Sciences recently stated, however, that 500 years was a more sensible and realistic timeframe of concern.

The two major studies completed within the past 2 weeks, one by the Office of Technology Assessment, and the other by the National Academy of Sciences, underscore the point that landfill disposal should be minimized to the greatest extent possible. Both studies concluded that landfills should be utilized only as a last resort and that alternative technologies must be emphasized.

In addition to the incalculable health and safety hazards it poses, landfill disposal presents enormous social and economic problems for our Nation as well.

As we in Tennessee have seen from the experience in Henderson County, public opposition to the site of landfills is understandably great. Citizens demand and deserve assurances of long term safety that no one can realistically give at the present time. Moreover, landfill disposal of toxic waste is grossly uneconomical in the long run. The Office of Technology Assessment has estimated that it costs 10 to 100 times more to clean up a hazardous waste site than it would to dispose of waste properly in the first place.

The Federal Environmental Protection Agency calculates that cleaning up the known sites around the country will cost, on the average, $6.5 billion each. How much cheaper it would have been to clean up that waste correctly the first time.

In light of the enormous problems associated with landfills, I believe it is time for our country to begin to move away from landfill disposal of hazardous waste. We must search for and utilize alternative technologies for treating and disposing of waste, and we must find ways to insure that landfill disposal is no longer the cheapest and easiest way for the companies to get rid of hazardous wastes.

That is why we are here today. The purpose of this hearing is to consider the various alternative technologies for hazardous waste disposal and how to encourage their utilization.

We are in Jackson because I believe it is important that a reasoned discussion of the hazardous waste disposal issue take place where it will benefit not just those of us in Congress, but the people of this State as well.

West Tennessee, in particular, has been a focus of the hazardous waste debate in Tennessee, not only because of the number of existing waste sites here, but also because of recent proposals to locate new sites in this area. An informed public is essential if we, as a State and as a nation, are to come to grips with this difficult issue and decide upon the proper course to follow.

We have with us today experts from around the country who have studied the problem of hazardous waste disposal and who are familiar with the alternative technologies.

We also have representatives from the Environmental Protection Agency to discuss current Federal and State efforts regarding alternative technologies.

And we have several fellow Tennesseans representing government, private industry, and the environmental community to discuss the particular problems that our State has had in addressing the problems of hazardous waste disposal.

Our first panel today consists of Mr. Joel Hirschhorn from the Congressional Office of Technology Assessment, and Prof. Michael Overcash from North Carolina State University, who is representing the National Academy of Sciences. As I mentioned, both the OTA and NAS reports were completed and made public within the last 2 weeks, and they will help us frame the issues for discussion today.

I look forward to their testimony and the testimony of all our witnesses as we look for creative and positive solutions to one of the most difficult health and environmental problems facing our Nation.

Let me say also that this hearing is 1 of 2 days of hearings on this topic. The second day of hearings will be held in Washington, D.C.

Now, I would like to recognize with great pleasure my distinguished colleague, who also represents Tennessee in the U.S. Congress, and who represents this community and the county as well as many others, Congressman Ed Jones.

Mr. JONES. Thank you very much.

Congressman Gore is the chairman of the most important Subcommittee on Investigations and Oversight of the Science and Technology Committee. I am delighted that Al consented to come to Jackson, Tenn., for this very purpose of holding this first hearing. I think at the outset I should mention that he has devoted a great deal of time already to this important subject, and he has spent his amount of time that he could afford to spend here in western Tennessee doing the job that he should do.

Al, I am indebted to you for the time we spent in Memphis together earlier last year and also for your being here today. Mr. Chairman, I appreciate your holding this hearing this morning, and I think it is well timed. It is particularly important because of

the problems that are here in west Tennessee that you refer to as experienced in recent years with hazardous waste disposal.

Many of you here in this audience are familiar with the problems that we have had, as well as Al and I are. We have discovered over here in Hardeman County and throughout Shelby County a large number of violations as far as the waste problem is concerned.

In addition, a major company sought permission to establish a hazardous waste disposal site just a few miles from here in Henderson County. After very vocal and unified objections from the people of this area, that proposal was withdrawn. And I applaud you people for the concerted effort that you showed in your interest in trying to do something about it. That is the way we get things done today.

However, with the experiences from throughout the country, it is important that we begin the task of determining what methods of disposal are available and what technology may exist today so that we can avoid some of the problems in the future.

Certainly the problem of disposing of hazardous waste has not been resolved completely. Congress has established the so-called Superfund to clean up hazardous waste dump sites. But it is equally important that we as policymakers understand the problems and the potential solutions for the future. It is only in this way that we can embark on public policy that insures the safety of our people, the protection of our environment, and that will build the confidence of all Americans so that they might further understand the options open to us in resolving this difficult and most complex problem.

I look forward to hearing some of the testimony here today and receiving information on what kinds of technology are available or under development for dealing with hazardous waste.

It is a subject on which you have become an authority, Al, and again I appreciate your concern in holding this hearing and your invitation to participate in this proceeding, in Jackson, Tenn.

Thank you very much.

Mr. GORE. Thank you very much, Congressman Jones.

I would like now to call our first panel of witnesses, Joel Hirschhorn from the Congressional Office of Technology Assessment, and Prof. Michael Overcash from the Department of Chemical Engineering and Department of Biological and Agricultural Engineering, North Carolina State University in Raleigh. If you would both join us at the witness table, we will take your testimony as a panel.

Let me state again that the two reports, for which you two are principally responsible, really stand out as landmark events in our Nation's understanding of this difficult and complex problem. I believe the appearance of the OTA report and the NAS study mark a turning point in our efforts to cope with this problem. And this is the first time anywhere in the United States that these two reports have been subjected to congressional examination, and we look forward to hearing from you today.

I am going to be particularly interested in any differences that you will find between yourselves, because, when two distinguished groups like OTA and NAS spend as much time as you have on this subject, the public can certainly benefit from a full discussion of it.

Mr. Hirschhorn, I would like to begin with your testimony. Without objection, the entire text will be put in the record, and if you want to summarize any portion of it, you may feel free to do so, but we are interested in hearing your presentation. Please go ahead.

STATEMENTS OF JOEL HIRSCHHORN, CONGRESSIONAL OFFICE OF TECHNOLOGY ASSESSMENT, AND MICHAEL OVERCASH, DEPARTMENT OF CHEMICAL ENGINEERING AND DEPARTMENT OF BIOLOGICAL AND AGRICULTURAL ENGINEERING, NORTH CAROLINA STATE UNIVERSITY, RALEIGH

Mr. HIRSCHHORN. Thank you, Mr. Chairman. I will summarize and amplify on a few aspects of the testimony.

First, I should note that we are responding to your request to summarize some of the results of this rather large study, those results in particular which deal with the use of technological alternatives to land disposal of hazardous wastes.

First, a general finding of our study is that land disposal, which is used nationally for as much as 80 percent of the hazardous waste, cannot even under the new EPA land disposal regulations, assure adequate protection of public health and environment either in the near term or the long term. I do want to emphasize that these new land disposal regulations we find to be inadequate based on technical analysis that we have performed and the details are in our study.

A particularly important point is that the current land disposal regulations contribute to an incomplete internalization of the full long-term costs of landfill disposal. What I mean by that is that the market prices for land disposal are in a sense artifically low, and that Government EPA regulations contribute to keeping land disposal costs artifically low. That is, some of the costs of land disposal are being shifted to the general public, to the Government as a whole, rather than having the people who use land disposal pay the actual cost for it.

A second point that I would like to make is that for many hazardous wastes that are land disposed, it is very clear that they should not be land disposed, that there are certain types of hazardous wastes, particularly high toxic wastes that are persistent and stable in the environment; that are mobile; that easily move through environment and that in some cases they accumulate in various parts of the environment, particularly living organisms; that these kinds of highly toxic wastes clearly should not be land disposed.

And more importantly, I want to emphasize that there are technical alternatives to land disposal for these kinds of wastes, alternatives that can be put in two broad categories. That is, you can reduce the waste generation at the source. You don't have to produce the waste, in other words. And alternatives that we call in a generic sense, treatment alternatives. Alternatives that permanently remove the hazards of the waste.

I think it is extremely important to stress that our study and report provides considerable detail on these technical alternatives, and that these many alternatives are technically proven already. They are out there waiting to be used. Of course, one could develop

more alternatives and they should be developed, but I do want to stress, from a technical point of view, alternatives to land disposal, putting waste in the environment, do exist.

I also want to stress, however, to provide some balance to this kind of discussion and debate, that the OTA study does not take a position against all land disposal, that one can envision some appropriate uses of land disposal for certain kinds of wastes. There is some confusion, I think, in the country over the fact that not all hazardous wastes are toxic wastes. According to the laws, there are categories of hazardous wastes that are not toxic. They are hazardous because of other characteristics. And these characteristics may include chemical reactivity, flammability, explosiveness, so that it is possible to think of land disposal being used in some cases.

We did look, in our OTA study, at the situation at the State level, and we had a survey conducted for us by an association of State hazardous waste directors. I would point out that in preparing for this occasion, we looked at the data we had available for the State of Tennessee that I thought might be interesting.

In looking at that data, we discovered that about 65 percent of the hazardous wastes were nontoxic. That is, again they were hazardous wastes, but they were not necessarily toxic wastes. About another 10 percent are inorganic wastes that can be stabilized through a solidification process; that is, rendered nontoxic and made suitable for land disposal. We sometimes use the term pretreatment; that there are some technology processes available to convert some—and I emphasize some—toxic hazardous wastes into a form that is appropriate for land disposal. And again, although these stabilization solidification techniques are proven technically and are available, they are not necessarily being used to their full extent.

In Tennessee, of the remaining 25 percent of the toxic organic wastes, it is technically feasible either not to produce the wastes or to treat them through a variety of alternatives that can be considered—chemical, physical, thermal, or biological. I won't go into the details of these alternatives. But I do want to stress that for this very hazardous class of waste, generally organic toxic materials, that there are, in fact, treatment alternatives that are well proven.

We don't have data for the State of Tennessee concerning the actual management of these wastes. However, I do want to point out that nationwide there are many wastes, again, that should not be land disposed that continue to be placed into the environment. And I would like to really stress what we think is the critical issue after studying this problem for 3 years, and that issue is, why are these alternatives to land disposal, technically proven alternatives, not being used to the greatest extent possible?

What we have discovered is that the chief answer for this situation is insufficient economic motivation for industry to use the alternatives to land disposal. And what we have proposed in our study for Congress to consider, as a complement I want to stress, to a regulatory approach. There is no substitute for improving land disposal regulations as well as other regulations covering hazardous wastes, and much of our study deals with the details of how to improve EPA regulations, and we should proceed along those lines.

However, I do want to stress that as a complement to the regulatory approach, which can have some positive effects in terms of raising the cost of land disposal, that our study proposes the introduction of direct economic incentives for the greater use of alternatives to land disposal. What we are trying to do is correct a situation that presently exists, as I have indicated, where we think the market prices for land disposal are too low and are kept low by some Government policies.

So, really what we did was asked the question: for those people who are in industry who have to make decisions on how to manage their wastes, whether or not to change manufacturing processes to reduce waste or whether or not to use incineration rather than land disposal, what would affect the decisionmaking on the part of these executives in industry?

What we think is a reasonable solution is a Federal fee system on hazardous waste generators. And I do want to stress that we are proposing consideration of a tax on the generators of hazardous wastes. Those are the people who can look sort of upstream back in their manufacturing processes. Those are the people who are also sort of at the back end of the plant and decide how to manage their waste. You want to do something that influences that important decisionmaking part of the process.

So we are suggesting that several levels of fees can provide direct economic incentives to reduce waste volumes or to treat waste as an alternative to placing the waste in the environment, and that this could be done by changing the basis of funding CERCLA, or so-called Superfund, from fees which are now based on chemical and petroleum feedstocks to fees based on wastes themselves.

And I would emphasize that changing the financing mechanism for the Superfund should be viewed as an evolutionary improvement which is made feasible by the progress already achieved under RCRA and CERCLA today, and which is made necessary by increasing awareness, as we have just heard, of the limitations of the regulatory approach and its ability to regulate and control land disposal of hazardous wastes.

I want to stress that the goal of this proposal is in a sense to integrate the Superfund and the Resource Conservation Recovery Act regulations, so that land disposal of newly generated waste will not create still more uncontrolled or Superfund sites in the future.

We have estimated that Superfund cleanups—and I think this is a very conservative estimate, by the way—will probably cost 10 to 100 times, as we have indicated, as much as it would have cost originally to manage waste in an appropriate manner.

I also want to stress that EPA is now aware of 15,000 uncontrolled sites. As you know, there are 481 sites on the national priority list. During the course of this study, we have watched that inventory of uncontrolled sites escalate monthly, literally. And from talking to State officials around the country, I am convinced that in the months and years ahead we will discover many more uncontrolled sites nationwide.

We estimated that it would cost $10 to $40 billion to clean up what we now know about, but again, I want to stress that many of the current EPA policies virtually guarantee the creation of more

uncontrolled sites. Examples include the fact that significant amounts of hazardous wastes are not now regulated at all.

For example, hazardous wastes from small generators legally can go to sanitary landfills all around the Nation. These sanitary landfills have no safeguards whatsoever to deal with toxic wastes and, in fact, many of the sites on the priority list now for Superfund were, in fact, sanitary landfills to begin with. So we know that current policies virtually assure the creation of more uncontrolled sites so that the key here is really what can we do now to stop this process, to get ahead of the game, so that we just don't keep on increasing the Superfund bill.

We have some information in the testimony to point out that the amounts of hazardous wastes already in the environment somewhat stagger the imagination. We did, I think, a conservative calculation of what went into the environment since the end of World War II, and it is quite likely that about a 100 million pounds of very highly toxic compounds are already in the environment. These are materials such as dioxin. These are truly large amounts, 100 million pounds compared to, for example, about 50 pounds of dioxin that contaminated the State of Missouri when put in oil that was spread over the land.

So the situation with regard to uncontrolled sites is a very serious one, and again we think that a Federal approach to this, using a fee system on generators can start to turn the tide, so to speak, so that we don't keep producing more uncontrolled sites.

In suggesting a Federal fee system on hazardous waste generators we are quite aware that many people will raise objections to this proposal, and I would like to very briefly anticipate some of these objections with you. We have asked many times in talking to people, is it feasible to implement a Federal fee system on waste generators?

I am the first one to admit that it would have been nearly impossible to suggest this as a feasible option in 1980 when the Superfund law was enacted. However, the situation has changed considerably since then. Fortunately, in response to various requirements under RCRA, as well as what we have seen going on under the Superfund Act, and because of many State initiatives, I want to empahsize there now exists the improved data base necessary to implement such a Federal fee system on generators.

I point out, for example, that the OTA study, and even with EPA data, we are aware of about 60,000 hazardous waste generators now being regulated nationwide. Even if the RCRA Act is reauthorized and so-called loopholes are closed, more generators brought into the system, even if we more than double the 60,000 figure, I am assured by people in the Government and Treasury and IRS that this is a very managable number of parties to collect taxes from nationwide. The United States certainly has a long history of experience in collecting taxes from very large numbers of parties. So even several hundred thousand generators do not present a difficult task.

Another issue that is often raised is that if we put a fee system in on generators, will there be some critical capital and R&D problems for industry, because clearly a fee system would tend to motivate people to use waste reduction, waste treatment, and then the

question is, well, do they have the capital available to change their plant facilities, to build perhaps new facilities; treatment facilities for example? Do they have the technology in fine detail that might be necessary for waste reduction and treatment?

Well, the answer is that, of course, there may be industries and companies that do have capital and R&D problems and needs that should be addressed. What we have suggested is that in some way that there should be Federal assistance for industry to help them with their capital and R&D needs, so that they can move away from land disposal and move toward waste treatment and waste reduction.

Another argument sometimes presented is, well, if we introduce a new fee or tax, will this somehow distort the economic marketplace, so to speak?

I want to emphasize that what we are proposing would correct a current distortion in the marketplace, which should be, I think, focused on by a number of people. That is, parties right now not directly receiving the benefits of the products or services that lead to waste generation are somehow paying the cost of cleaning up hazardous waste problems in the Nation.

So the purpose of the fees on generators, particularly I emphasize on land disposal choices, is to, as I say, internalize, bring back the full costs of the long-term management of hazardous waste so that both waste generators, and I emphasize, consumers, citizens, who consume products and services that lead to the generation of hazardous waste, that they, too, bear the cost of waste management. We have coined the phrase, hazardous waste intensiveness of products to help educate the public that they are buying the product, they are buying the services which lead to hazardous waste generation.

I do want to emphasize that hazardous waste is one of those things in reality that has no social benefits. There are no reasons to want to produce hazardous waste. And so we need to introduce into the markeplace sort of a feedback, loops so that the public indeed perhaps have to pay higher costs if they wish to continue to consume products and services that lead to hazardous wastes.

Another issue is, will the taxes or fees on generators place too heavy a burden on industry?

Here, I want to emphasize that in most cases the fees that we envision would not place a harsher, but in all honesty, for most parties, fees could increase the cost perhaps from 50 to 100 percent.

The adverse effects on generators could be minimized by a couple of things:

One, by providing sufficient time before implementation to allow industry to plan and make the changes necessary so that they don't continue to place waste into the environment. and therefore, they can avoid themselves the high fees.

Second, I do want to emphasize something appropriate to this subcommittee, that consideration be given to Federal assistance for capital and R&D needs. If we anticipate those problems, some of the problems that industry faces can be eliminated.

Very briefly, people ask, well, what is this fee system proposal all about? I won't go into a lot of detail, but I do want to emphasize we envision several categories for waste management so that there are

different levels of fees. For example, that there would be fees that would be quite high for the most hazardous wastes that are land disposed. Fees would be lower for wastes that are chemically, thermally, biologically or physically treated instead of or prior to land disposal; and fees should be lower for a high volume low hazardous waste. We are very sensitive to those industries that do produce high volume wastes which are not hazardous.

I might also suggest that there are other things that could be done through a fee system. For example, there may be no fees on recycling activities and recovery activities. There may, however, be fees that are related to the transportation of waste.

There may also be a difference in fees for those wastes that are going to so-called grandfathered land disposal facilities. One of the subtleties of EPA regulations is that there is a grandfathering clause, so to speak. And most wastes in the United States will go to grandfathered land disposal facilities that do not have to meet very stringent requirements under the regulations. It is pretty clear to us that those wastes going to those grandfathered facilities should be heavily taxed, in a sense, in order to provide a disincentive for using those facilities.

So just to sum up, I would like to stress that the concept of fees on generators has not been created by OTA, and I would like to emphasize that a number of States have already instituted fee systems on hazardous waste generators. We reviewed several of those State systems in our report.

However, I also want to stress that it is not possible, we think, to rely on State fee approaches for several obvious reasons: Not all States legally will or can introduce fee systems. Those States that might introduce fee systems will not do it in the same way. So we are in a situation where industry could face a great number of fee systems throughout the Nation; no consistency nationwide. So there seems to be a basic need and argument for a uniform Federal fee system that industry can deal with nationwide.

By the way, a fee system that raises sufficient funds, I want to stress that in the State systems that we have exmained, because of the pressures at the State level, we have rarely seen a State system that places high enough fees, high enough to influence management decisions nor high enough to raise the kinds of funds necessary for Superfund activity. So it does not seem feasible to rely strictly on State approaches.

Other than that, my last comment is that we have been heartened by the fact that many people support this concept of a fee system. And, again, I want to stress not merely to raise funds for the Superfund activities, but also to move away from land disposal. There are people in industry who support the concept. There are many people at the State level who support the concept. And I think the more the public understands about the concept and its very positive effects on changing the waste management practices in the United States in the years ahead, the more public support there will be for this proposal.

Thank you.

[The prepared statement of Mr. Hirschhorn follows:]

STATEMENT OF JOEL S. HIRSCHHORN

PROJECT DIRECTOR, OFFICE OF TECHNOLOGY ASSESSMENT

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

March 30, 1983

Mr. Chairman and committee members, my statement responds to your request for a summary of those results of the recently completed OTA study TECHNOLOGIES AND MANAGEMENT STRATEGIES FOR HAZARDOUS WASTE CONTROL which deal with the use of technological alternatives to land disposal of hazardous wastes.

First, a general finding is that land disposal, which is used for as much as 80 percent of hazardous wastes, cannot even under the new EPA land disposal regulations assure adequate protection of public health and environment, either in the near-term or decades from now. Moreover, the current regulations contribute to the incomplete internalization of the full, long-term costs of land disposal and, therefore, help keep land disposal costs artifically low in comparison to the costs of alternatives. Our report provides details on how current land disposal regulations shift costs from industry to government and society as a whole.

Second, for those wastes for which land disposal is clearly inappropriate, such as highly toxic wastes that are persistant, mobile, and bioaccumulative, there are technically feasible alternatives that could be used to reduce the volume of wastes generated or to treat wastes so as to

permanently remove hazards. Our report provides detailed discussions of these alternatives, including some problems with controlling treatment facilities such as emissions of toxics from incinerators, and the limitations of recycling and other waste reduction efforts.

It is important to stress that land disposal is appropriate for some hazardous wastes, for the most part those wastes that are hazardous because they are chemically reactive, flammable, or explosive rather than because they are toxic in some way. Although here too there may be wastes that would pose unacceptable risks by being land disposed. For example, in the state of Tennessee, according to data obtained for OTA through a survey of the States, about 65 percent of the hazardous wastes are non-toxic. And about another 10 percent are inorganic wastes that can be stabilized through a solidification process, rendered non-toxic, and made suitable for land disposal. Of the remaining 25 percent of toxic organic wastes, however, it is technically feasible to either not produce the wastes or to treat them through chemical, physical, thermal, or biological means to permanently remove the toxic threat.

We do not have data for Tennessee concerning the actual management of these wastes. However, nationwide many wastes that should not be land disposed continue to be placed into our environment. Why then are alternatives to land disposal not being used to a greater extent?

The chief answer is that there is currently insufficient economic motivation to use alternatives to land disposal. As a complement to the regulatory approach, which can have some limited effects on raising the costs of land disposal, the OTA study proposes the introduction of direct economic incentives for the greater use of alternatives to land disposal. When the problem of compensating for artificially low land disposal costs is corrected, it is likely that the private sector will also deal more effectively with

associated issues such as the need in some areas for regional facilities, special arrangements for small waste generators, and problems with siting treatment facilities.

We have examined the feasibility of using a Federal fee system on hazardous waste generators; such a fee system would also provide a means to influence current management decisions. Several levels of fees can provide direct incentives to reduce waste volumes and to treat wastes as an alternative to placing still more hazardous waste into the environment. Changing the basis of funding for CERCLA from fees based on feedstocks to fees based on wastes should be viewed as an evolutionary improvement made feasible by the progress achieved under RCRA and CERCLA to date, and made necessary by the increasing awareness of the limitations of the regulatory approach.

The goal is to integrate CERCLA and RCRA so that the land disposal of newly generated wastes will not create still more uncontrolled sites in the future. Extensive CERCLA funded cleanups generally will cost 10 to 100 times as much as it would have cost initially to manage the wastes so as to avoid future cleanups. The cost to the nation of cleaning up the currently known 15,000 uncontrolled waste sites is likely to be at least $10 to $40 billion. If only one-one hundredth of one (.01) percent of the hazardous waste disposed of in the nation's land since World War II (probably about 20 million metric tons average per year, or about one trillion pounds) were highly toxic, then 100 million pounds of highly toxic compounds threaten our health and environment. In comparison, only about 50 pounds of dioxin in contaminated oil was spread in Missouri. More sites are still being revealed, and present policies and regulations almost assure more uncontrolled sites for the future.

The following is a brief summary of the waste generator fee option

(policy option III in the report), preceded by a brief discussion of some objections to such a system.

POSSIBLE OBJECTIONS:

1. Is it feasible to implement such a Federal fee system?: It would have been difficult to implement this approach in 1980 when CERCLA was initiated because of the lack of information on waste generators and wastes. Fortunately, in response to various requirements under RCRA and because of many State initiatives, there now exists the improved data base necessary to implement such a system. And with some time provided before implementation, of such a system, there will be ample time and motivation to further improve the data base. Both the results of OTA's survey of the States and EPA data indicate a total of about 60,000 hazardous waste generators nationwide. Even a doubling or more of this figure by ending many of the exemptions under RCRA, would not overwhelm a national reporting and fee collection process.

2. Are there critical capital and R&D needs?: Some waste generators and commercial waste managers may need capital for waste reduction or treatment equipment or they may encounter technical problems requiring R&D. The solution for both is to tie the Federal fee system to Federal assistance for those capital and R&D needs that are directly related to desired changes in hazardous waste management practices. Assistance can be provided in ways that do not necessitate direct Federal outlays, such as by loan guarantees. A portion of the Federal fees collected could be used to support these assistance programs.

3. Will fees distort the marketplace?: Fees on wastes would correct a current market distortion wherein parties not directly receiving the benefits of the products or services that lead to waste generation, and release of

hazardous constituents into the environment, have to pay for necessary cleanup actions. The purpose of the fees (particularly on land disposal) is to internalize the full costs of long-term management of hazardous wastes so that both waste generators and consumers of "hazardous waste-intensive products" pay, rather than shifting costs to the government or society as a whole.

4. Will fees place too heavy a burden on industry?: Many fees will represent a small fraction of current waste management costs, probably from 5 to 20% for many cases. But in other cases, costs may increase from 50 to 100 percent. Naturally, fees must be great enough to affect waste management decisions. Adverse effects on generators can be minimized by (1) providing sufficient time before implementation to allow planning and changes, and (2) providing Federal assistance for capital and R&D needs. If current gaps in RCRA regulatory coverage are closed, more wastes will be regulated. Income from fees could in principle allow the general level of fees to be reduced. In addition, fees on generated wastes would be spread equitably throughout society in direct proportion to the corporate and personal responsibility for contributing to the problems of hazardous wastes, and who benefitted from their generation.

OBJECTIVES OF A FEDERAL WASTE GENERATOR FEE SYSTEM:

- To shift the balance from disposal of hazardous wastes in the land to the reduction of waste generation at the source and to treatments that permanently destroy or detoxify wastes.
- To better prevent the formation of new uncontrolled waste sites that endanger the public and require massive spending for cleanups.

CHARACTERISTICS OF A FEDERAL WASTE FEE SYSTEM TO ACHIEVE GREATER USE OF ALTERNATIVES TO LAND DISPOSAL AND TO REFLECT REAL COSTS MORE ACCURATELY:

1. Fees should be much higher for the most hazardous wastes that are land disposed.

2. Fees should be lower for wastes that are chemically, thermally, biologically,or physically treated instead of or prior to land disposal.

3. Fees should be lower for high volume-low hazard wastes (i.e., not hazardous because of toxic properties).

4. There should be no fees for wastes that are recovered or recycled onsite for their energy or material value.

5. The fee structure should be simple, using several generic categories of wastes and fee levels. (Note that administration of a fee system is far easier than administering a technically complex regulatory system.)

6. There may be higher fees on wastes managed offsite because of the greater potential for CERCLA actions resulting from transportation accidents and spills.

7. There may be higher fees on wastes disposed of in land disposal facilities regulated less stringently than new ones because they are "existing portions" of operating facilities as defined in RCRA regulations.

RELATIONSHIP TO CURRENT RCRA AND CERCLA PROGRAMS:

A Federal program of economic incentives would constitute a "market" approach to complement the "command and control" regulatory approach under RCRA. It provides another means to achieve the same fundamental goal - protection of public health and the environment - but the "market" approach compensates for inadequacies in the technical basis of RCRA regulations and

standards, and in the administration and enforcement of them by EPA. While RCRA and CERCLA may have some indirect incentives for improving management practices, their effects are both slow and uncertain.

The proposed Federal fee system would replace the current CERCLA funding mechanism based on fees on chemical and petroleum feedstocks; these have little relationship to amounts or types of hazardous waste generated or to the quality of their management. Changing to CERCLA fees on wastes would provide a direct and more equitable means to influence current RCRA management practices. A Federal waste generator fee system would help to integrate CERCLA and RCRA into one coordinated Federal program.

RELATIONSHIP TO STATE ACTIVITIES:

Several States have already instituted fees on waste generators. There are good examples of simple fee structures, particularly from Minnesota, New York, and California, and these are described and discussed in our report.

The major issue is that while some States may use waste generator fees, many others will not or cannot. A uniform, national fee system provides equitable uniformity and is needed to prevent the formation of "pollution havens." Moreover, State fees often produce minimal revenues, and sometimes are not used to fund hazardous waste activities.

States' support for the Federal fee system could be achieved by providing the States a portion of the funds collected so that State hazardous waste programs have both adequate and assured funding. (This would replace current but uncertain RCRA grants to the States and an absence of Federal funding for many CERCLA activities.)

USE OF FUNDS:

The funds collected could be used for: (1) supporting expanded CERCLA activities, (2) supporting State programs, and (3) providing Federal assistance for capital and R&D efforts required by industry to reduce waste generation or use treatment alternatives to land disposal (this is an integral part of our policy option). OTA believes that it is possible to raise the necessary funds for these three uses (from $1 to $2 billion annually) without causing major economic hardships on either industry or consumers.

EPA'S AND INDUSTRY'S POSITIONS:

On the record, there is evidence that EPA supports the concept of CERCLA fees on wastes rather than feedstocks, supports the concept of raising revenues for State programs by using fees on waste generators, and supports "market" approaches to achieving regulatory goals of environmental protection. But they have made no clear statement on a Federal waste generator fee system.

The Chemical Manufacturers Association has testified in support of a Federal waste generator fee system for CERCLA. It is also our understanding that other trade associations and various companies are also likely to favor this approach. However, it is clear that many companies not now assessed under CERCLA would face new payments under this proposal.

Mr. GORE. Thank you very much. We will hold up on questions to you, Mr. Hirschhorn, until Professor Overcash has finished his statement.

Before turning to you, Professor Overcash, I would like to welcome Congressman Richard Durbin of Illinois, who has joined us for this hearing. We are delighted to have you here. I believe you have had some problems similar to these up in your home State, have you not?

Mr. DURBIN. In my 20th Congressional District of Illinois we have a town called Wilsonville, which some of you may be familiar with. There was a hazardous waste site. A small community decided to fight one of the largest companies in the Nation and was successful at both the Federal and State level. I am very sensitive to this problem and appreciate the invitation to be here today.

Mr. GORE. Well, we are mighty glad to have you and we hope you will be doing some good here today.

I can tell you, Mr. Hirschhorn, as you know, I am intending to sponsor legislation in the Congress to implement the recommendation which OTA has made that we change the nature of a fee system, and I will explore that with you in questions in just a moment.

Without objection, I would like to include in the record of this hearing at the appropriate place, the summary of the OTA report, which you have provided to the subcommittee. That is about a 30- or 40-page summary as opposed to the 400 and some odd page study that was 3 years in the making. We won't burden our official reporters with that longer study, but we will put the shorter one in there.

[The information is available in Committee files:]

Mr. GORE. Prof. Michael Overcash was instrumental in preparing the National Academy of Sciences study on this same subject. He is with the Departments of Chemical Engineering and Biological and Agricultural Engineering in North Carolina State University.

Professor Overcash, we appreciate your diverting your attention from the NCAA finals in which North Carolina State has substantial interest, in being with us here today.

Without objection, we will put the entire prepared statement in the record, and we invite you to present your remarks at this time.

Mr. OVERCASH. Thank you.

The National Academy of Sciences Committee started off with two objectives, primarily stated in the information which you have in front of you.

First, was to identify what were the major impediments, if you would, in the next 5 to 10 years which might prevent the implementation of improved hazardous waste management practices in the United States.

Mr. GORE. Could you move that microphone a little bit closer to you there? OK.

Mr. OVERCASH. Those considerations, if you would, are not really aimed at RCRA, but more at technology itself.

Mr. GORE. Now, when you say RCRA, for those who are not familiar with that, RCRA is the way a lot of people refer to the Resource Conservation and Recovery Act. There are two laws: RCRA, which has the regulations governing disposal of waste, and Super-

fund, which is the imposition of a fee to be used later on to clean up any abandoned dumpsites. So excuse me for interrupting, but when you said RCRA, that is what you meant?

Mr. OVERCASH. Yes.

Our first objective then was oriented toward the technology side of managing hazardous wastes.

The second objective was to identify those issues which are of concern or which are not adequately addressed, if you would, in the present practices of hazardous waste management in the United States. This second objective arose out of the experience of the committee members who are both from the academic, as well as the industrial community, who have been observers of what is going on in hazardous waste management today. I think in this second objective we tried to identify those subtle but potentially very important reasons for impediments in further improvements, if you would, in hazardous waste management.

The committee did adopt the present regulatory structure for defining what is a hazardous waste. We felt that that definition was sufficiently broad. The amount of diversity of wastes captured in that definition was such that our conclusions would not be altered if we further expanded that definition at a later point in time.

The committee did discuss, agreed on, and supports the OTA recommendations on a level of hazard approach, as opposed to a more or less on and off kind of decision relative to hazardous wastes. We began our deliberations with an attempt to structure technology in hazardous waste management. We felt that that was a very important part of the deliberations which go on both in our committee and elsewhere in this general area of deliberations. That structure is given for you on page 3 of the information you have there.

Our purpose in structing technology were threefold: one, to clarify our understanding, particularly with respect to the comparison of alternatives.

How does an alteration in the copper recycling in a plating facility compare to a deep well injection facility? That is a very difficult comparison, and without some structure for the technological approaches, it is very difficult to make such a comparison.

Our second purpose in that structure was to establish priorities. We feel that the structure we have arrived at allows you to look generically at approaches rather than at a specific technology, and make comparisons of what might be a better approach as opposed to a less desirable approach.

Third, to review the present status of hazardous waste management in the United States relative to a technological framework.

If we go to the diagram, which you have in front of you, I would like to just briefly go through the sequence. This is a hierarchy in a classical sense, in that preference is given to the technologies which appear at the top of the page as opposed to that at the bottom.

The first grouping is the so-called waste elimination or in-plant alternatives, and followed by the group of technology referred to as conversion, basically bringing hazardous waste in the front door and converting it into either less or nonhazardous wastes as it might leave the facility.

Finally, perpetual storage and the groups of technologies which fit in that category.

I might point out to you that the first four technologies under conversion are those in RCRA itself or the legislation. And the first four technologies in perpetual storage are also included. However, there are other alternatives which are not included, but are the subject of deliberation.

If we look at the overall assessment of this hierarchical approach, we can see that in the in-plant alternatives, that this is probably the most diverse when it comes to technical alternatives. It is very waste specific, very manufacturing specific. If you were to choose to look at regulations or incentives in this area you would find that it would require a very sophisticated and very innovative approach because of the proprietary considerations associated with this in-plant relationship for these materials. That does not rule out the possibility in this area, but it does suggest a more strong incentive system rather than fee systems.

There are two elements that go into a national system for waste elimination. They would be certification that waste elimination indeed is occurring. And then, of course, whether you would use an incentive or a penalty system to further augment such an approach. This is probably the most powerful approach that exists for the management of hazardous waste, because it does eliminate the generation, if you would, and the so-called snowball effect of having to then have a manifest, have to treat it, have to go on in the various long-term considerations. So that is certainly an area that represents a very powerful approach.

Looking at the second grouping, the conversion grouping, our conclusions were that there is certainly no single technology in that group which can or should be expected to handle even the major percentage of all wastes. That is, it will take a combined effort of many technologies to satisfy the diverse hazardous waste picture in the country today.

All of the technologies that exist within that grouping exist in large part today. Echoing the comments of Mr. Hirschhorn, this technology does exist, and it is rather interesting that some of them are actually less expensive than secure landfills, and yet their adoption has not reflected that economic structure.

We also found that centralized facilities which do many of these conversion or treatment operations at one point might well represent economies of scale and utilize trained personnel, which is so important in this area of technology.

And an issue which I will speak to in a few minutes, on environmental equivalence, would greatly shift the emphasis to this area and away from perpetual storage.

If we look at the overview of our present status in this country, we could see that the relevance of this diagram that—well, before I get to that, look at the perpetual storage alternatives. There is a difference between what we might refer to as ultra stable or very desirable land disposal options or perpetual storage options such as salt domes or arid region unsaturated zone storage, which in comparison to so-called secure landfills, might indeed come closer to a long-term secure approach.

So I think that does reflect back on something we need to reflect on in this committee and elsewhere, and that is the use of rather precise terms when it comes to discussing these alternatives. I don't think the public can discern, and our own technical individuals cannot discern, when we refer to land disposal as a broad category and include in it such alternatives as land treatment, which in our diagram is illustrated as a conversion technology and not a perpetual storage alternative, and when it also includes what might be referred to as ultra stable or highly stable alternatives in the same terms as secure landfills or waste piles. So there is a need to constantly guard our definition and our precision of those definitions.

If we look at this overall hierarchical approach, we can see that in the United States, as Mr. Hirschhorn, I think, has correctly assessed, our present U.S. practices are disproportionately in the bottom group. They are in the group of perpetual storage. Eighty to ninety percent is the number utilized for that.

This contrasts rather sharply with the technical approach utilized in some areas of industrial Europe where if you take this same diagram and put in percentages, such as a 100 percent of what gets started in the overall system and what in Europe or Denmark in particular goes into perpetual storage is like 10 to 15 percent of what we are calling hazardous waste and are allowing in our so-called secure landfills.

If we go back up one step to the conversion technology, we use the numbers from OTA, we find that in that grouping probably 20 to 70 percent of the wastes could be eliminated prior to the need for conversion technologies.

I think when you compare that to our existing practice, you see a very substantial gap between what is existing and might be done and what is, in fact, done. And I think our committee tended to highlight this rather obvious gap.

The reasons for this gap have primarily to do with the concept that for perpetual storage alternatives, secure landfills, and other alternatives, the cost beyond 30 years, which is in the regulations today, is essentially discounted to zero. And as a consequence, the costs for that entire period of time, which goes from 30 years to potentially greater than 1,000 years, has no cost at all. Even if there were a minimal cost per year, when we multiply it times 1,000, it gets to be a rather significant figure.

So I simply approach the problem as we did from a somewhat different direction, but arrived at somewhat the same conclusions, that is, that this discounting of the truly long term conditions which results in the condition that we presently observe today in waste management practices.

If we look on page 6 of the information in front of you, you see the economic picture portrayed in a graphical form, and I only stop for a second to illustrate that one technology there—and it only happens to be one of the technologies for which the statement is true—actually costs less than the secure landfill. That is, land treatment. However, it is not widely used and therein lies some of the subtle problems in the existence of technology versus the acceptance and adoption of technology.

I would simply summarize in the last page of the information. I believe that the recommendations and the conclusions of the committee are rather lengthy and I would hope they would be submitted in the record. If I could summarize them in three points it would be as follows:

One of the major inhibitions that the committee observed in moving toward improved systems for national management of hazardous waste had to do with public opposition. That is not a condemnation or a statement that does any more than reflect that there is a belief on the part of the public in so-called zero risk and zero discharge, and that until we get out of the zero risk anticipation and get into acceptable risks, definable risks, or however you choose to define that problem, that there will be and will continue to be substantial opposition to almost any hazardous waste facility. That is another way of stating the fact that the public has a very large difficulty in discerning between betterment in technologies for managing hazardous waste as opposed to less attractive methods.

I use the illustration that if we had a magic process that would take hazardous wastes and convert it into Food and Drug Administation approved jellybeans, that the public would probably oppose that with equal ferocity as it would an uncontrolled dump site. That inability to discern, which is again I think the difficulty on the part of the public—it is simply an observation—is one of the impediments in proceeding ahead in adopting innovative approaches.

We felt, as a committee, that the new direction, the direction which we could recommend and did recommend, was toward treatment and elimination. And within the perpetual storage alternatives, it was toward those alternatives which might really give us low or zero annual costs and a high probability of containment in the range of 5 to 10 centuries.

Finally, the observation that the present hazardous waste management program offers a substantial and perhaps unintentional incentive for the potentially least desirable of the perpetual storage technologies, thereby, it does inhibit treatment and elimination. It encourages public opposition to obvious technical flaws in the legislation. It does transfer the responsibility to future generations, and it does not require the achievement of nonreducible or low hazard criteria for material placed in any of the perpetual storage alternatives.

Thank you.

[The prepared statement of Mr. Overcash follows:]

Testimony to Subcommittee on Investigations and
Oversight of the Committee on Science
and Technology, U. S. Congress

On Report of Committee on Disposal of
Hazardous Industrial Wastes from the
National Materials Advisory Board Report
of the National Research Council,
National Academy of Science,
and National Academy of Engineering

Entitled "Management of Hazardous Industrial
Wastes: Research and Development Needs"

by

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March 30, 1983
Jackson, Tennessee

NAS Committee Objectives

1) identify the major impediments for the next 5-10 years that may prevent improvements in the manner by which the industry of the United States manages hazardous waste

2) identify issues that are of concern or are not adequately addressed in the present practices regarding hazardous waste

The Committee adopted the present RCRA definition of hazardous waste

- the amount and diversity of wastes that are included is thus truly large
- exclusion of other wastes was not a severe restriction relative to the conclusions reached

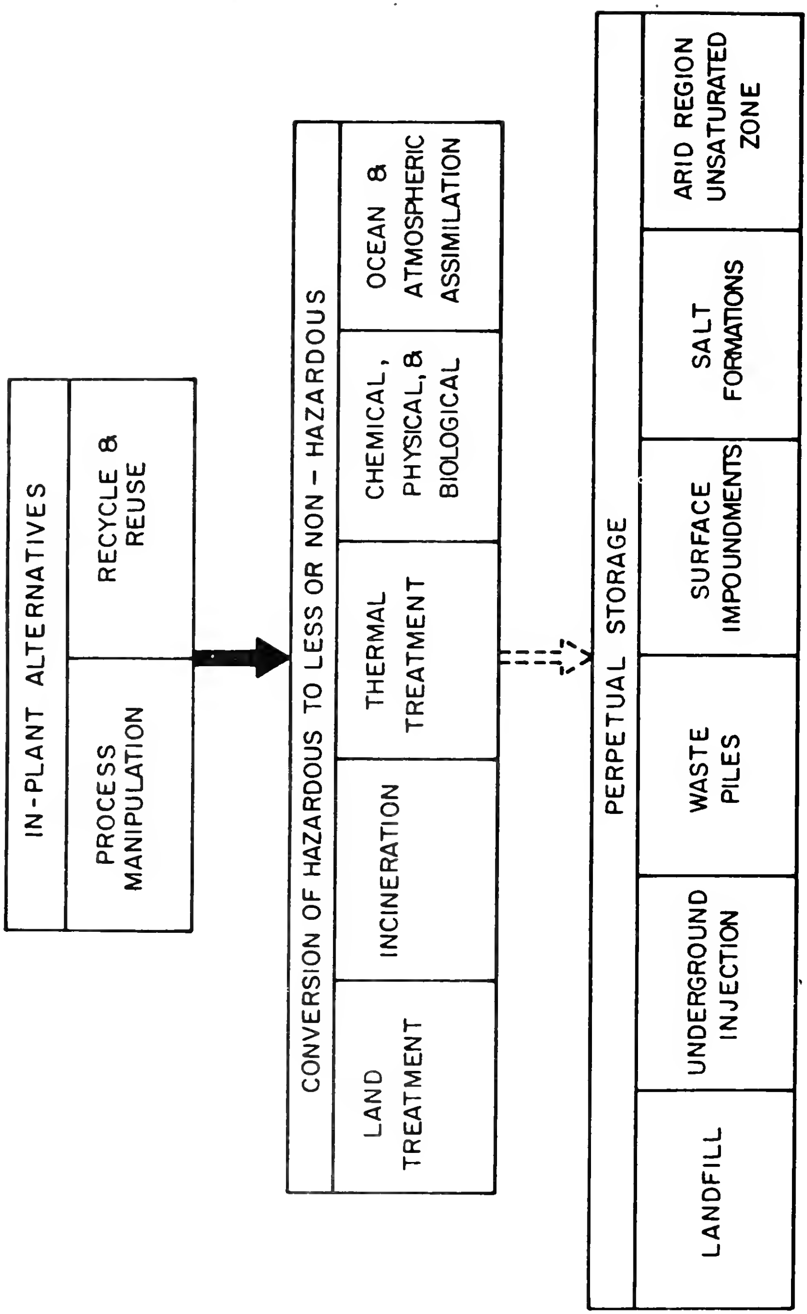
The Committee agrees and supports the OTA identification of level of hazard as a better approach

- hazard and health risks are not Boolian in character
- a continuum approach would better serve industry and the public

A structure to organize the entire field of hazardous waste management was developed.

Purpose

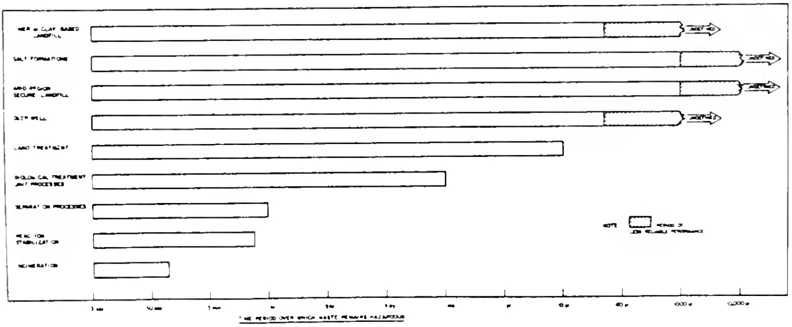
- clarify understanding, especially for comparison of alternatives
- establish priorities
- review present status


IN-PLANT ALTERNATIVES
PROCESS MANIPULATION
RECYCLE & REUSE
CONVERSION OF HAZARDOUS TO LESS OR NON - HAZARDOUS
LAND TREATMENT
INCINERATION
THERMAL TREATMENT
CHEMICAL, PHYSICAL, & BIOLOGICAL
OCEAN & ATMOSPHERIC ASSIMILATION
PERPETUAL STORAGE
LANDFILL
UNDERGROUND INJECTION
WASTE PILES
SURFACE IMPOUNDMENTS
SALT FORMATIONS
ARID REGION UNSATURATED ZONE

OVERVIEW OF HIERARCHAL SYSTEM

- present U. S. practices disproportionately in perpetual storage class
- contrast to some European systems is sharp
- the concept of ENVIRONMENTAL EQUIVALENCE is useful in assuring that all legitimate costs are included
  - the capital, operating, and environmental contingency costs be calculated for each teachnology for the entire period in which the waste remains hazardous (or 1,000 years whichever is less)

RELATIVE TIME BASES

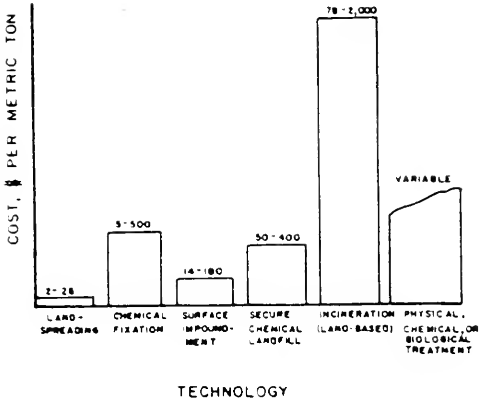


WASTE ELIMINATION

- Probably the most diverse (i.e. waste-and manufacturing facility-specific)
- Requires a sophisticated and innovative approach since proprietary considerations of manufacturing are large.
- Two elements
  - certification of waste elimination
  - incentives or penalties system
- Probably the most powerful long term approach - eliminate before generating a hazardous waste

CONVERSION FROM HAZARDOUS TO LESS-OR NON-HAZARDOUS

- No single technology can or should be expected to handle even a major percentage of all wastes.
- All technology exists for a major part of present hazardous waste to be managed through treatment, and is demonstrated at large scale. Some are even less expensive than secure landfills but are still inhibited.
- Centralized facilities to treat hazardous waste have such economies-to-scale and utilization of technical personnel that encouragement of formation is important.
- Environmental equivalence analysis will favor such present day waste conversion from hazardous to less-or non-hazardous.



Environmentally sound technologies are available for treatment and disposal of hazardous waste. Costs vary widely, according to type and volume of waste handled, and are substantially in excess of unsound practices.

Source: EPA, Draft Economic Impact Analysis, 1979.

PERPETUAL STORAGE OPTIONS

- Some perpetual storage of non-reducible residues is necessary.

- Substantial technical, economic, and social differences among the technologies in this group, hence opportunities as a nation to improve.

- If we achieve the level of practically non-reducible and select the truly longer-term options for storage then we have better fulfilled the social contract with future generations.

  The presently utilized and envisioned secure landfill will

  - require truly long term monitoring (centuries).

  - require an adequate fund for clean-up or amelioration.

  - leak in a time period much less than the period that the material remains hazardous (or even several centuries).

ALTERNATIVES AND NEEDS

- A major inhibition in moving toward improved systems for national management of hazardous waste is

  - public opposition through belief in zero risk and zero discharge.

  - public difficulty in recognizing the improved environmental attributes of hazardous waste treatment facilities.

- The new directions must be

  - toward treatment and elimination.

  - toward perpetual storage options with low or zero annual cost and a high probability of containment for 5-10 centuries.

- The present hazardous waste program offers a substantial (and perhaps unintentional) incentive for the potentially least desirable perpetual storage technology thus

  - inhibiting treatment and elimination.

  - encouraging public opposition of obvious technical oversights.

  - transferring responsibilities to future generations.

  - do not require achieving non-reducible or low hazard criteria for placement in landfill.

Mr. Gore. Without objection, we will include in the record the introduction of that summary as well as the recommendations and conclusions.

[The material referred to follows:]

MANAGEMENT OF HAZARDOUS INDUSTRIAL WASTES: RESEARCH AND DEVELOPMENT NEEDS

Report of the
Committee on Disposal of
Hazardous Industrial Wastes

NATIONAL MATERIALS ADVISORY BOARD
Commission on Engineering and Technical Systems
National Research Council

Publication NMAB-398
NATIONAL ACADEMY PRESS
Washington, D.C.
1983

INTRODUCTION

Hazardous industrial wastes, as defined by the Resource Conservation and Recovery Act (RCRA) of 1976 (Public Law 94-580), consist of ignitable, corrosive, reactive, or toxic materials. These hazardous wastes account for 10 to 15 percent of all industrial wastes or about 35 to 40 million metric tons per year, a quantity that is growing about 3 percent per year (Maugh 1979). The study that resulted in this report represents recognition by the study's sponsors--The American Institute of Chemical Engineers (AIChE) and the Environmental Protection Agency (EPA)--that better and more environmentally sound treatment and disposal options must be available for these hazardous industrial wastes. Specifically, the sponsors requested that presently available waste disposal technologies be examined to identify their limitations and that research needed to support the development of new and improved methods be recommended. Emphasis was to be on new technologies for managing hazardous wastes, but existing technologies were to be considered where specific needs have been identified.

Hazardous industrial wastes can be considered to be all the by-products of an industrial facility that have no apparent use or value and that can pose an unacceptable risk to people and the environment if discarded carelessly. The committee conducting this study, however, believed that this definition was too broad and chose to limit the type of wastes to be considered. The committee restricted its considerations to hazardous solid and liquid wastes generated by industry during the processing and synthesizing of materials, omitting hazardous waste materials covered under the Clean Air Act and the Clean Water Act and mine tailings and drainage, stack effluents, slag and ash, nuclear wastes, hospital wastes, municipal refuse and sewage, agricultural wastes, wastes at abandoned waste dumps, and improperly stockpiled material. In Figure 1, the general relationship among pollution control activities for industry is depicted. The shaded portion represents technologies or processes used by industry for manufacturing or for wastewater treatment that can influence hazardous waste management. Usually this influence occurs by process modification, resulting in solid or liquid hazardous wastes that are less in volume or degree of hazard. The committee provided examples of technologies that reduce volume or degree of hazard but did not address this area in detail because of the proprietary or highly specific character of these process modifications. Starting with a material that was generated and defined as a hazardous waste, the committee examined specific technologies for treatment, conversion, or perpetual storage as the primary focus of hazardous waste management.

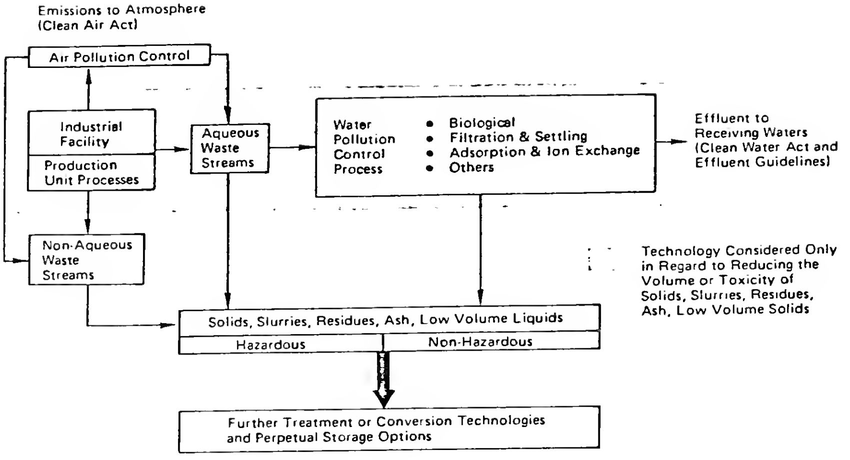


FIGURE 1 Generation of hazardous industrial wastes.

The committee's discussions of hazardous industrial waste problems and solutions were supplemented by presentations from academic, government, and industry experts involved in areas of hazardous industrial waste management and disposal. On the basis of these discussions and presentations, the committee set the objectives and developed premises and assumptions that provided direction for this report.

The committee concluded early on that public perception, sociopolitical forces, and other non-technical factors are substantial influences on the nationwide management of hazardous wastes. This linkage of technical and non-technical issues was subsequently developed in this report by a description by the committee (as a body of informed citizens in these non-technical areas) of the issues related to public perception and by a substantial description in this introduction of the assumptions, clarification of issues not elaborated, and the framework for organizing the specific technologies that were considered.

The committee recognized that any classification system for wastes, no matter how desirable, is artificial and designed to portray or explain a specific purpose. Such a simple classification system would not be capable of representing or even listing the total spectrum of known hazardous wastes, treatment and disposal technologies, and other chemical, physical, hazard- and cost-related parameters. Instead, the committee considered the wastes mentioned on page 1 and then defined broad-based technologies that might be appropriate for their treatment and disposal. During the committee's study, several waste classification schemes were reviewed; viz., process stream categories in RCRA, risk assessment and degree of hazard classifications being developed by the Office of Technology Assessment (1981), technology and chemical property matrices under study by the Chemical Manufacturers Association. These schemes were designed to serve a specific purpose and solve particular problems for the authors such as enforcement of and compliance with regulations, prioritization of wastes for disposal, research and development funding, and utilization of capital and equipment resources.

The specific premises and assumptions established by the committee are discussed in the following sections. Although each set of premises and assumptions is discussed separately, some overlap was unavoidable.

PUBLIC PERCEPTION

The segment of the public most concerned with hazardous industrial waste problems and solutions consists of those individuals who are or are likely to be directly affected by the problems and solutions. This group includes individuals who live adjacent to an industrial facility or disposal site, individuals who live downwind or downstream of a facility or site and may be affected by discharges from the facility or site, community leaders, and individuals who may benefit from the industry producing the wastes or the availability of the hazardous waste disposal site.

No single technique or method presently available or expected in the near future is a panacea for hazardous industrial waste management problems. Thus, a variety of methods and options must be used to manage these wastes in an environmentally sound manner. The public, however, appears not to appreciate the necessity for multiple approaches and continues to seek a single, simple solution. Unfortunately no such single solution exists. In addition, the public's lack of understanding of the issues makes it impossible to distinguish among clearly superior and inferior solutions to hazardous waste management problems. This lack of understanding about how hazardous wastes are generated and managed can have a number of adverse effects: Stifling of innovation, seeking of simplistic solutions, stockpiling of hazardous wastes, intervening by government, utilizing "quick fixes" (disposal by the most expedient available technology) and illegal methods.

The committee believes that overcoming this lack of understanding is an important hazardous waste management need. Although this issue was outside the scope of the committee's study, the committee emphasizes that the success of any technical, scientific, or research solutions it recommends is contingent on a change in this sociological situation. During its deliberations, the committee assumed that progress will be made and that the public will develop a more rational view of hazardous waste management.

GENERAL SOLUTIONS

A variety of approaches to the management of hazardous industrial wastes are outlined in Subtitle C of the 1976 Resource Conservation and Recovery Act (RCRA). These techniques as well as several other important methods for hazardous industrial waste management were considered by the committee (Figure 2). There are basically three general options: elimination or reuse of the hazardous waste, conversion of the hazardous waste into nonhazardous or less hazardous material, and perpetual storage. These general options differ substantially in terms of philosophy, time-frame, technique, and economics. At present, perpetual storage methods are the most prevalent and, hence, are the focus of attention for both regulatory and industrial personnel.

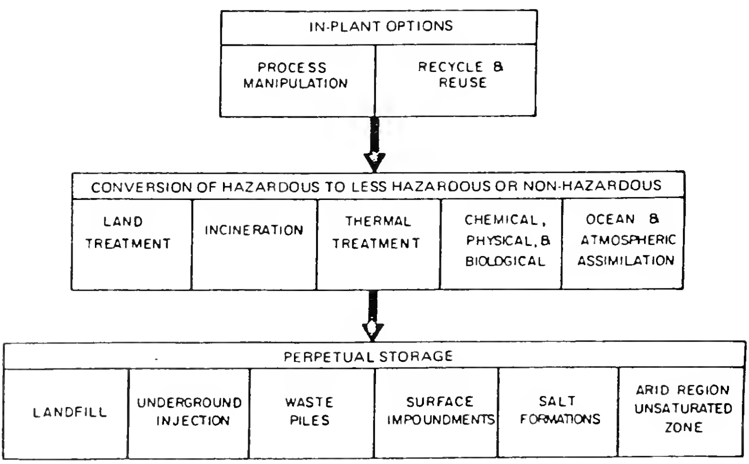


FIGURE 2 Hazardous waste management.

Optimum, successive utilization of the three general options would result in a decreasing amount of hazardous wastes as treatment proceeds in the direction of the arrows in Figure 2. Only small volumes of the more inert materials should be considered for perpetual storage. The hierarchy identified in Figure 2 should be followed in the management of hazardous wastes: (1) in-plant options should be used to reduce the volume and toxicity of generated hazardous wastes, (2) wastes that are generated should be converted to less hazardous forms and should be reduced in volume, and (3) remaining residues and wastes that are hazardous should be stored in a manner that minimizes risks to the environment and the public.

Identification and understanding of this hierarchy permits rational decisions to be made, best risk solutions to be identified, and better public understanding of the issues. The management approaches outlined in Figure 2 also stress that no one approach is sufficient to solve hazardous industrial waste management problems. Further, the concepts identified emphasize prevention and reduction rather than treatment and storage and aim to reduce the risk to the environment and public. Thus, the emphasis is on positive rather than negative management options.

IN-PLANT OPTIONS

In-plant options are probably the most effective and economical means of managing hazardous wastes. These options represent approaches that generally minimize impact on public health and the environment. Minimizing or eliminating waste production is substituted for end-of-pipe management. These options include:

1. Process modifications to eliminate or reduce the volume of specific hazardous wastes. These involve altering the chemistry or the chemical engineering operations to achieve the desired waste elimination or reduction within the constraint of acceptable and economical product manufacturing.

2. Recycle and reuse processes to prevent materials from being discharged from the plant as waste. Use of these techniques recognizes that the hazardous components of wastes may be usable reactant materials in other production processes.

As the costs of waste treatment and disposal increase, cost-reduction achieved through recovery of chemicals from the waste stream prior to disposal will become more important. The value of reclaimed chemicals plus the savings in not having to dispose of them could match or exceed the original disposal costs. An example may be cited from the leather and tanning industry: Chromium removal from wastes has been well demonstrated, but the net gains from recovery and sale on the commercial chromium market have been marginal. However, the substantially increased costs of secure landfill or even the lower cost

of land treatment under pending RCRA regulations indicate that it will probably become significantly more cost-effective to remove the chromium from such wastes (Overcash 1980).

Because of the largely proprietary nature of the technologies, the committee decided not to undertake an extensive technical review of or make recommendations on process modification and recycle and reuse. However, the committee strongly recommends a major commitment, both philosophically and in funding, to approaches that prevent or eliminate hazardous materials from being discharged as wastes.

CONVERSION TECHNOLOGIES

Technologies that convert hazardous wastes into less hazardous or nonhazardous wastes fall into two classes:

1. Incineration, thermal treatment, chemical, physical, and biological processes, all of which convert wastes from a hazardous to a less hazardous or nonhazardous state. These processes produce a residue (either as a by-product or as a waste stream) that may or may not have an adverse environmental impact and that must be discharged to the environment or stored in an environmentally sound manner.

2. Land treatment that converts the hazardous wastes but also provides the ultimate disposal site.

Combinations of these conversion processes can be used to manage hazardous industrial wastes. These technologies are consistent with the philosophy of environmental regulations (i.e., to render hazardous industrial wastes nonhazardous).

PERPETUAL STORAGE

Perpetual storage is the most prevalent existing hazardous waste management practice. Each perpetual storage technology attempts to place the waste material in a highly condensed or concentrated configuration in which the hazardous constituents do not move. Generally little or no conversion from a hazardous state occurs, and, hence, care, monitoring, and migration prevention are required for an indefinite period. The committee decided that at least 500 years was realistic as a period of concern for hazardous wastes in landfills and perpetual storage options. Regulations under RCRA establishing the period of concern for landfills as 30 years were considered by the committee to be unrealistic. Careful attention to design for containment over such short control periods does not eliminate the probability of containment system failure after 30 years. Instead, the likelihood of adverse impacts and the realistic costs of perpetual care by compliance to the letter of the law are only masked.

The storage technologies clearly involve a long-term obligation because with time, particularly at a closed site, most of the changes that can occur are adverse (e.g., eventual penetration of a surface cover, gas diffusion and leakage to the atmosphere, and leakage of mobile constituents to groundwater). As an illustration, experience with some nuclear waste repositories (not specifically discussed in this report) provides an example of unsuccessful results with long-term storage. Despite the best intentions these have a proven record of leakage to the environment during a relatively short period amounting to a small fraction of the 500-year lifetime deemed necessary by the committee to be a realistic period for perpetual storage.

The central questions to be addressed with regard to perpetual storage concern the technology and the procedures for implementation. The question still not being widely addressed is how to accommodate these sites over their probable, greater than 500-year life. It is indeed possible that hazardous waste problems and consequences are merely being postponed and will have to be dealt with by future generations. If this could be argued convincingly (or even addressed), then a realistic consideration of the direction for hazardous waste management could be undertaken. The committee believes that this question, although it is not within the scope of this study, should be evaluated critically before public acceptance of perpetual storage of hazardous industrial waste can be expected. The committee concludes that it is desirable to select the perpetual storage alternatives that are the most stable and provide the maximum isolation from the rest of the environment.

TIME-FRAMES

The options noted in Figure 2 have different liabilities and time-frames associated with them. The in-plant options relate to very short time-frames (hours to days), with effects limited to those of short duration (i.e., those resulting from extreme operating conditions). They are subject to normal community acceptance and Occupational Safety and Health Administration considerations.

The environmental and societal effects of conversion technologies in Figure 2 involve an expanded time-frame (minutes to years). Short- and long-term effects on air and groundwater quality must be addressed. Dispersion occurs in a current time-frame and is taken into account as part of the design and monitoring approach. Its effects must not violate acceptable air, drinking water, and land use standards. Thus, the effects of these technologies are essentially short term.

For the storage category in Figure 2, the time-frame is much longer (decades to centuries). The liability is therefore likely to be shifted from those who generate or store the waste (the present generation) to future generations. These technologies could provide a potentially adverse environmental legacy.

For technologies in which the character of the hazardous waste remains for a long period (30 years) there is increasing likelihood of non-containment. Reliable containment for very long periods (1000 years) is an advantage when the true costs of monitoring and remedial action are included with the placement of a waste in such facilities. The shorter the lifetime of the hazardous waste technology, the better the control and the lower the dispersion potential generally associated with that technology. Longer storage periods create much larger unknowns and much less opportunity for management and control.

ZERO RISK AND ZERO DISCHARGE

The concepts of zero risk and zero discharge are interwoven explicitly and implicitly into most environmental discussions. That one cannot achieve zero risk or zero discharge is clear to the committee and has been basic to its discussions and recommendations. The laws of thermodynamics and probability assure that zero risk or zero discharge cannot be achieved. Although the committee did not attempt to assign quantitative values to acceptable risk, it recognized the critical need to develop methods of risk assessment and put them into practice.

It has been argued that zero risk and zero discharge serve as valuable goals for society even though they may be unachievable. Regulations have often accepted that philosophy. However, this impossible target has become a liability in achieving real progress. Goals of zero risk and zero discharge initially were effective in overcoming inertia but have since become an impediment to progress in hazardous waste management. Thus, the committee rejected the criteria of zero risk or zero discharge in evaluating the acceptability of technologies for hazardous waste management. To the extent that the public maintains a belief in zero risk and zero discharge, there will be major difficulties in managing hazardous wastes. The committee concluded that the major part of all risk and discharge must be assumed in a present day time-frame and not deferred to future generations.

In the area of risk acceptance, the committee believes that risk quantification is urgently needed. Most activities of daily life pose some risk of injury, sickness, or death. Similarly, there is some risk associated with hazardous waste management, and some alternatives have higher risks than others. It is critical that some level of risk assessment be put into practical use. This could occur through a combination of scientific and judicial review and opinion, regulatory practice, professional society standards, and public awareness and acceptance.

The Office of Technology Assessment (1981) approached this problem in terms of a degree-of-hazard concept applied to regulatory policies. This is a limited approach and focuses on criteria for defining a hazard. The broad and more important problem is the level of acceptable risk. That some technologies, when applied to hazardous

industrial wastes, will have higher risk factors than other technologies must be considered in decisions regarding such wastes (including their management and/or ultimate disposal).

GLOBAL ASSIMILATIVE CAPACITY

As discussions in the committee proceeded, it became clear that the global environment (atmosphere, sea and estuarine systems, and terrestrial mass) should continue to constitute a source of usable, natural treatment processes. The committee's decision to consider all phases of the total earth environment was based, however, on the assumption that treatment, or dilution accompanied by physical or chemical action, could occur without serious or irreversible damage to the environment. The burden of proof as to the reasonable absence of potential environmental damage caused by such use should rest primarily with the waste disposer rather than with private environmental organizations or government agencies.

The critical requirement is that treatment (specifically, conversion to nonhazardous material) actually occurs. For example, the use of the upper two meters of soil to decompose and fix constituents of hazardous waste is a method that uses the terrestrial environment to accomplish treatment. Thus, land treatment was recognized by the committee as a proper use of the assimilative capacity of nature.

The committee also recognized that the atmosphere and ocean have an assimilative capacity for hazardous waste, although a policy of restricted use of the ocean assimilative capacity for hazardous waste is in direct conflict with some international accords. The scientific community is in disagreement over the advisability of using ocean assimilation (Goldberg 1981, Kamlet 1981) even though the assimilative capacity is acknowledged to exist. The committee recognized this conflict but concluded that further research and pragmatic approaches to assimilation by the global environment might be valuable in dealing with the international problem of hazardous wastes.

Research on the utilization of the treatment and assimilative capacity of all phases of the global environment was considered justified by the committee. Several statements summarize the committee rationale in this area:

1. The use of selected parts of the total earth environment has already been successful; thus, the existence of the earth's assimilative capacity has been demonstrated.

2. Within restraints that avoid environmental degradation, the use of the environmental assimilative capacity can be a continuing process. The use of such self-renewing techniques assures little or no burden on future generations, but only if the extent of the assimilative capacity is known. The challenge is to quantify the treatment potentials.

3. The more sensitive parts of the global environment have lower assimilative capacities, not zero tolerances. Economics will dictate whether a specific phase of the environment would actually be used, assuming that there are adequate controls over such use.

In general, the committee believes that with adequate testing, monitoring, and regulation, the successful utilization of the global environmental assimilative capacity, including that of the soil, atmosphere, and the ocean, could be a viable and justified technological alternative in the management of industrial hazardous waste.

ECONOMICS

The committee recognized that economics underlie almost all of the decision-making in selecting management options for hazardous wastes. Several facets of the economic picture appeared universal.

First, the use of all technologies, regardless of the présent degree of development, will be improved if there are cost reductions. Those options that have the lowest costs and produce the best control will be more widely utilized. In many cases, the only existing economic analyses for newer technologies derive from small-scale, laboratory-level applications. Full-scale research or usage should result in a better knowledge of actual costs. The lack of specific recommendations by the committee regarding work toward lower costs should be construed only as recognition that such a need exists almost universally among hazardous waste management technologies.

Second, the committee determined that obtaining reliable cost estimates of ongoing hazardous waste management was an important need. It is esssential to know what typical investment and operating costs are at full-scale industrial facilities. This area is cloudy because both *a priori* calculations and commercial sales information are being utilized simultaneously in comparisons of alternatives. More actual systems evaluations are a universal need in the management of hazardous wastes.

Third, the committee concluded that cost comparisons must be made on an "environmentally equivalent" basis. Comparisons between technologies that detoxify wastes and those that store material for a 30-year period only confuse short- and long-term economics. From the standpoint of technology assessment, all alternatives should be evaluated using the same ground rules. The comparison should include costs from the time of hazardous waste generation until the hazardous characteristics have permanently disappeared or can be assumed immobilized even over very long periods.

This type of environmentally equivalent economic determination is certainly not being made for one notable technology--hazardous waste landfills. The present costs of operating these facilities do not

include realistic long-term costs. There is an obvious preference for turning responsibility over to some level of government for long-term costs and liabilities. Thus, incomplete landfill costs are currently compared with those for a chemical detoxification facility or a land treatment system in which the hazardous wastes are rendered nonhazardous. Such comparisons are not environmentally equivalent and do not provide a true measure of societal costs.

The committee did not attempt to list in-place and operational costs for each environmentally equivalent technology. This, however, should not be construed to mean that economics is not an important factor.

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CONCLUSIONS AND RECOMMENDATIONS

GENERAL

Hazardous industrial wastes exist and must be dealt with in the context of present day society. Fewer hazardous wastes (in volume and degree of hazard) will be generated in the future as process changes and in-plant modifications are made. However, complete solutions for hazardous wastes will still require treatment, conversion, and perpetual storage of the lesser amounts of materials that cannot be otherwise eliminated or recycled.

The disposal of hazardous wastes is a national problem, one that affects the national economy and the national future. Academia, government, and industry should all play a role in meeting the research and development needs for hazardous waste management.

There currently exists some technology or combination of technologies capable of dealing with every hazardous industrial waste in a manner that eliminates the need for perpetual storage. At least in principle, inorganic components can be separated and reused and organic compounds can be destroyed. In general, however, the present state of development of many of the required technologies is such that they are not commercially available at a cost that makes their use feasible.

An objective of the sponsors was to have recommendations for new technological approaches to hazardous waste management. However, the committee found no major new and cost-effective approach. Since no single, existing technique is likely to be developed into a panacea, funding should be continued mainly to improve existing technologies, particularly for making methods more reliable in design and operation and more cost-effective for specific waste streams. Further, current technologies involving perpetual storage must continue to be used, at least for the immediate future, and the problems they cause must be faced.

All hazardous industrial waste disposal technologies involve some risk since zero risk and zero discharge are not achievable. It is essential that alternative technologies be subjected to a quantitative risk assessment that takes broad account of societal concerns. The committee concluded that the concept of "environmental equivalence" should be used in these comparisons. Such assessments must be acceptable to the public as well as to the scientists and engineers who are knowledgeable in the field.

All hazardous industrial waste disposal technologies need complete economic evaluation, so that comparisons can be made of their actual costs. Economic evaluations must include the long-term (sometimes in excess of 500 years) facets of certain hazardous waste management alternatives.

To a large extent, specific disposal technologies are particularly suited to specific hazardous industrial wastes. In general, therefore, wastes should not be mixed together or diluted without reason, and, in addition, the choice of disposal technologies should be based on specific waste disposal needs.

The disposal of hazardous industrial wastes should be approached in a hierarchical fashion, first attempting to minimize waste production through process modification and recycling, next seeking to convert the waste to nonhazardous or less hazardous forms, and finally making use of perpetual storage.

The committee recommends that:

1. A centralized, accessible, and periodically updated economic evaluation of each hazardous industrial waste disposal technology be developed, together with an assessment of each technology's availability and state of commercial development.

2. A methodology for hazard and risk assessment of hazardous industrial waste disposal technologies and transport be developed and applied. Both public and environmental risks should be covered in a manner that allows comparison with existing risks that are acceptable to society.

3. An educational program be established to provide the public and industry with soundly based information on the options and risks associated with the disposal of hazardous industrial wastes.

4. A methodology for dealing with the problems of siting of hazardous waste treatment and disposal facilities be developed, with particular attention to regional treatment facilities.

5. Resource recovery or waste elimination receive first emphasis in all considerations of hazardous industrial waste management.

6. Manufacturers of products plan ahead for the ultimate treatment and disposal of these products and the by-products of their manufacture so as to minimize technical problems and adverse environmental consequences.

INSTITUTIONAL CONSIDERATIONS

Progress toward the satisfactory management of hazardous industrial waste is inhibited by nontechnical as well as by technical shortcomings.

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_istitutional in nature, and they are so fundamentally involved in any discussion of waste disposal technologies and technology applications that their consideration cannot be avoided.

Public attitudes toward hazardous industrial wastes and their disposal reflect a number of misconceptions. Among these are beliefs that hazardous waste generation can be eliminated, that waste discharges can be avoided, that waste disposal can be made risk free, and that hazardous waste disposal technologies are equally risky to the local environment and health. Satisfactory management of hazardous industrial wastes depends on an informed and enlightened public.

Long-term reliability and consistency in the management of hazardous industrial waste disposal operations must not be hampered by changes in regulatory philosophy, hasty legislative and regulatory actions in response to problem situations, inconsistent enforcement, and technically unachievable regulations that discourage all but minimum compliance with current requirements. Satisfactory management of hazardous industrial wastes depends on establishing goals for the long term and adopting a consistent, realistic approach to achieving them. The public deserves nothing less.

Local jurisdictions have generally been unwilling to act jointly to bring about the establishment of centralized waste treatment facilities, where larger scale operations would provide efficiencies in cost, environmental control, and resource conservation and recovery. A reluctance to deal with the problems of hazardous industrial waste management on the part of a single jurisdiction often rules out action on the part of others. Satisfactory hazardous industrial waste management depends on a commonality of effort to resolve a national problem.

The committee recommends that:

1. A program of public education, in the broadest sense, be initiated to inform and to provide a positive view of the necessity of overall management of hazardous industrial wastes, the nature of the alternative technologies, and the success of disposal operations that could serve as models for future developments.

2. Review and revision of existing legislation be considered to assure its consistency and technical validity, particularly with regard to the long term and the enforcement of regulations, and to establish reasons for public confidence in the goals set for the management of hazardous industrial wastes.

3. The federal government encourage the formation of centralized facilities for the treatment of hazardous industrial wastes by arranging to coordinate such activities, by seeking the removal of legal barriers at the national, state, and local levels, and by providing assurance to the public that concerns for health, safety, and the environment will not be neglected.

CHEMICAL AND PHYSICAL TECHNIQUES

Chemical and physical techniques, described classically as unit processes and unit operations, consist primarily of conversion (degradation) processes such as neutralization, oxidation, reduction, and precipitation and separation (concentration) processes such as distillation, filtration, and adsorption. A very large number of these techniques are available, and they are used widely in dealing with hazardous industrial wastes, both in manufacturing and treatment operations. Their application may come before, after, or as part of another treatment method or they may themselves be sufficient. Known wastes consisting of one or a few hazardous components can often be disposed of effectively using these techniques, but they are less suitable for wastes of mixed or variable composition. They have the advantage of being carried out under controlled conditions, and this allows risks to be minimized.

Although, in principle, chemical and physical techniques could be developed to dispose of any hazardous industrial waste, it is unlikely that this would be a generally cost-effective approach. However, even in current applications, improvements could be made if more fundamental data on the thermodynamic, kinetic, and transport properties of the waste materials were available. Particularly with organic materials, general property correlations would help in the optimization of separation processes and thus facilitate recovery of valuable compounds. Specific chemical procedures such as the reductive dechlorination of chlorine-containing organics, should be considered.

The committee recommends that:

1. Experimental determination of physical properties of various hazardous waste species and mixtures be continued. Additional research on predictive and correlational methods is warranted.

2. Processes for metal removal and recovery from hazardous industrial waste streams be investigated to improve the options for pre-treatment of wastes to be disposed of by biological techniques, land treatment, and incineration. Ion exchange, adsorption, and liquid extraction methods are likely candidates for development.

3. Separation processes based on supercritical fluids, liquid membranes, and foam fractionation (especially microgas dispersions) be developed further. Separation of organics from largely aqueous waste streams would allow the use of incineration.

4. Research be directed toward a low-cost process for removing water from slimes and sludges, so that the chosen disposal method (perhaps by land treatment, permanent storage, or landfilling) can be simplified.

BIOLOGICAL TECHNIQUES

Biological waste treatment processes have been widely used for the treatment of both municipal and certain industrial wastes, and the technology is well established in these areas. Although there can be applications to hazardous industrial wastes, biological treatment processes will generally constitute only one step in a hazardous waste treatment and disposal system. There are a large number of biological treatment processes that use indigenous or adapted microbial organisms for the removal or detoxification of hazardous industrial wastes. In these systems, waste constituents can also be removed by air stripping, volatilization, and adsorption on solids. As with chemical and physical processes, biological processes are carried out under relatively well-controlled conditions of residence time, temperature, and pH.

Biological waste treatment processes can be adapted to liquids, slurries, and solid organic wastes. Toxic constituents can inhibit microbial growth in such processes, and there can be difficulties in maintaining a sufficiently diverse population of microorganisms to metabolize the waste materials at desired rates. Detailed information is needed on the ability of biological treatment processes to detoxify specific hazardous industrial wastes using both indigenous and genetically manipulated organisms.

The committee recommends that:

1. The mechanisms of hazardous industrial waste removal be studied in one or more existing or clearly usable biological treatment processes so that better utilization of this alternative can be developed and the transfer of toxic pollutants from one medium to another can be minimized.

2. Analytical measurement techniques, beyond fish bioassay methods, be developed to provide measures of detoxification when biological treatment processes are used.

3. Genetic engineering of microorganisms be investigated as a means of improving detoxification of hazardous industrial wastes. Competition from naturally occurring organisms should be investigated.

4. Thermophilic biological techniques be studied to determine if improved detoxification and removal can be achieved economically with these processes.

LAND TREATMENT

Land treatment makes use of the assimilative capacity of the environment in the disposal of hazardous industrial wastes, taking advantage of natural biodegradation processes as well as environmental chemistry. Organic materials are metabolically degraded, and both

organic and inorganic materials are subject to oxidation or reduction and to immobilization by adsorption and reaction in the soil. Land treatment has been applied successfully in the disposal of municipal and non-hazardous industrial wastes as well as in the treatment of hazardous industrial wastes.

In principle, land treatment is capable of handling all hazardous industrial wastes. In practice, the capacity of the land for specific waste components may be limited by the cost of land areas to match assimilative capacity to waste generation. Therefore, pretreatment of the waste may be required to achieve reasonable costs. Pretreatment may also be considered as a means of extending the life of land treatment systems receiving constituents that accumulate. The behavior of the constituents in a land treatment system can affect air and water receiver systems, and therefore, designs for land treatment must take into account both short-term and long-term environmental effects.

The committee recommends that:

1. The data base for the design of a land treatment system be expanded, with emphasis on transferable laboratory- or pilot-scale information and refinement of this information in selected field-scale systems.

2. The economics of full-scale hazardous waste land treatment systems be further documented.

3. Process modification and pretreatment be investigated as adjuncts to land treatment.

4. An effort be made to make industry aware that land treatment has technical and economic potential.

OCEAN ASSIMILATION

Ocean assimilation, like land treatment, makes use of the assimilative capacity of the environment for the disposal of hazardous industrial wastes. Many of the same assimilative processes operate to degrade and detoxify wastes, but here particular attention must be paid to impacts on marine life and the overall ecological system because of the relatively rapid dispersion which occurs.

Indiscriminate ocean dumping of waste materials has led to banning any form of ocean disposal. This, however, should not preclude investigations into the use of the oceans for hazardous industrial waste disposal under strictly controlled conditions; the oceans, which occupy some 70 percent of the earth's area, may indeed provide a valuable self-renewing resource. Except in connection with past problems caused by specific wastes, often in specific locations, relatively little is known about the degradation of wastes in the marine environment. High dilution

is likely to make such studies difficult, but it may well facilitate the degradative processes by minimizing the impact on the marine environment. As with land treatment, pretreatment of wastes to remove specific components may be required.

The committee recommends that:

1. The effects of selected past ocean disposal (dumping) of wastes be determined to assess the possible consequences of ocean disposal of hazardous industrial wastes.

2. The dispersal and degradation rates of hazardous industrial waste constituents in the marine environment be studied.

3. Systems be developed to monitor ocean disposal processes and their impact on marine ecology.

4. Modeling of ocean assimilation be studied.

INCINERATION

Incineration is a useful technique for the conversion of hazardous industrial wastes to less or non-hazardous materials; it is applicable to all organic materials provided the necessary temperatures and residence times can be achieved. It finds widespread use in a large variety of installations, among them boilers, kilns, furnaces of special design, open pits, rotary hearths, and vertical shaft incinerators. These can be powered by both hydrocarbon and refuse-derived fuels. In some cases, energy can be recovered with the co-generation of heat or electricity.

For many organic materials, incineration affords the most complete means of waste management available via current technology, but emission controls are frequently required to prevent air pollution. The inorganic components present in waste produce slag and ash that must be disposed of and, on occasion, toxic volatile materials that must be collected. Shipboard and ocean platform incinerators avoid some of the problems associated with emissions but entail significant transport problems for all but hazardous industrial waste generators located near ocean coasts. With more precise information on the temperature and time requirements and design parameters for specific classes of wastes, a more extensive use of incineration would become feasible, particularly if processes were to be developed for existing industrial boiler systems.

The committee recommends that:

1. The rates and products of combustion of hazardous industrial wastes be determined as a function of waste type, temperature, and residence time to assess the feasibility of widespread use of existing systems for incineration.

2. Fuel additives and improved scrubbing systems be studied and developed for improved control of incinerator emissions.

3. Operational studies of offshore platform incineration be carried out.

4. Policy and economic studies of ocean shipboard incineration be undertaken.

THERMAL METHODS

Thermal methods utilize heat rather than the open flame of incineration to decompose and detoxify hazardous industrial wastes by oxidation and pyrolysis. Examples include catalytic and reactive fluidized bed systems, molten salt reactors, plasma arcs and torches, microwave systems, and pyrolytic processes. Of these, only pyrolytic processes have been widely used in industry. Thermal methods are generally applicable to hazardous industrial wastes, but they are usually more costly than incineration and are more suitable for disposing of specific wastes for which conventional incineration is not readily adapted.

Although higher heat transfer coefficients may result in lower temperature requirements for destruction than with incineration, several of the thermal methods, particularly those involving microwaves and plasmas, require high energy inputs that make them less economically attractive. On the other hand, fluidized bed media can be selected to react with inorganic components such as chlorides, thus reducing or eliminating problems with emissions. In addition, a number of thermal methods are suited to operation on a scale smaller than that of conventional incinerators, making portability of the treatment facility possible. Overall, thermal methods offer considerable promise for disposing of specific, difficult wastes.

The committee recommends that:

1. Operating parameters for the destruction of specific hazardous industrial wastes in molten salt, fluidized bed, wet air oxidation, and pyrolysis systems be determined.

2. The selection of materials of construction for molten salt, fluidized bed, wet air oxidation, and pyrolysis systems be studied to improve corrosion resistance and operating life.

3. Plasma and microwave systems be investigated for destruction and detoxification of hazardous industrial wastes that are difficult to handle.

4. Pyrolysis methods be developed for organic wastes as a means of detoxification and conversion to usable forms, such as fuels.

5. Evaluation of co-catalyst systems for use in conjunction with specific technologies (i.e, wet air oxidation, fluidized beds, and specific waste streams) be investigated.

LANDFILLS

Landfill is currently the major method used for the disposal of hazardous industrial wastes. In the past, landfills were indeed "toxic dumps," but today, since they are regulated, they are better described as "secure landfills," intended basically as permanent storage that provides "perpetual" isolation from the environment. To assure perpetual isolation, however, requires perpetual care at a cost that is generally being ignored.

For the immediate future, landfills represent a necessary technology for disposal of hazardous industrial wastes; but, for the long term, they may not remain the major alternative for perpetual storage. In the future, only non-reducible inorganic residues might be considered for any perpetual storage alternative. The contents of a landfill are recoverable, at least in principle, to the extent that the landfill is properly managed and controlled. There is, however, a good deal that is not known about long-term landfill behavior, and policies for long-term care and management of landfills have yet to be established.

The committee recommends that:

1. The use of landfills be minimized to prevent the likely migration of constituents of the waste into groundwater.

2. Systems be developed for improved sampling and monitoring of hazardous industrial wastes in soils and leachates.

3. Modeling of migration from landfills be studied.

4. Liner and cover materials be evaluated for long-term performance.

5. Materials and methods of encapsulation and solidification be investigated, with particular attention to long-term behavior.

PERMANENT STORAGE OR DISPOSAL

Permanent storage or disposal involves deep well injection or underground burial, with or without barriers to migration and with or without immobilization by solidification or fixation. Currently, deep well injection is practiced fairly extensively with liquids, but, like landfilling, the practice has been declining. With disposal in mines and salt domes, wastes are, in principle, recoverable. However, these techniques approach disposal with the expectation that the wastes will be so isolated by distance or by degradation that they will never again encounter the biosphere.

A variety of sites are available for this method of disposal, among them solution cavities, worked-out and abandoned mines, and geological basins. Such locations, however, have not been adequately inventoried and characterized, and there is not much known about the degradation and reaction rates of wastes and their possible migration in many potentially usable regions.

The committee recommends that:

1. An inventory of possible sites for permanent disposal be generated, with information on site characteristics and potential problems in handling the disposal of solids, liquids, and slurries.

2. A more concerted and directed research effort be made to assess the feasibility of using as burial sites for hazardous wastes the thick unsaturated zones (water free) underlying much of the western United States. The utility of these zones may be pivotal in providing a reasonable solution to the whole problem of disposal of hazardous wastes.

3. Chemical degradation and reactivity studies of liquid hazardous industrial wastes in the injection environment be carried out, taking account of the temperatures, local brine chemistry, pressure, and fluid migration rates.

4. The long-term stability of containers and encapsulated or solidified materials in the disposal environment be investigated.

5. The long-term stability and performance of various kinds of barriers between wastes and the local environment be studied.

Mr. GORE. How long did the National Academy of Sciences task force spend on this project?

Mr. OVERCASH. Something on the order of a year and a half.

Mr. GORE. And Mr. Hirschhorn, your study was 3 years in duration, is that correct?

Mr. HIRSCHHORN. Yes.

Mr. GORE. You mentioned, Professor Overcash, the significance of public opposition. We will be exploring that question in a later panel. But let me just start by asking the two of you, essentially the public is correct in opposing landfill disposal so long as the current practices are in effect, aren't they?

Mr. HIRSCHHORN. Yes. I must say that in all honesty, I think the more technical detail one knows about this problem, the more support you would give to the public opposition. The fact is that new and current EPA regulations are not technically adequate. I would also point out that there are even problems in the short term. It is not just worrying about 50 years or 500 years. There are inadequacies in the regulations which relate to what may happen next month or next year.

For example, people who run land disposal facilities do not have to provide financial assurance that they will take corrective action if something goes wrong a week from now or a year from now.

I would also point out that there is a lack of regulations for the alternatives to land disposals. So that is one of the reasons why some of these alternatives are not used. You can't use something

when you are in a state of limbo with regard to what EPA is going to do from a regulatory approach.

Mr. OVERCASH. I might suggest that the argument that you have proposed has some subtle ramifications to it.

Mr. GORE. It has some ramifications that are not so subtle, too.

Mr. OVERCASH. Exactly. The subtle ones, however, are that if you would consider, under the definition of land disposal, such technologies as we are considering, for example, for high level radioactive wastes, truly good, long-term containment, then the public opposition would probably not be as well founded as it would for the way we view most technologies for secure landfill.

Mr. GORE. Yes.

Mr. OVERCASH. And we might also observe that their opposition extends to facilities that treat hazardous waste, like incinerators and biological treatment, et cetera.

As long as it has the definition "hazardous" attached to it, their opposition is surprisingly strong.

Mr. GORE. Well, the point I was seeking to make is that the Government's approach to this problem is so inadequate today that the public is justified in concluding that it is not being handled responsibly.

Now, that is a different question than whether or not the public opposition would be soundly based and justified if the problem were handled differently. If the toxic waste were separated out and were treated responsibly and then you had a high volume of truly nontoxic waste and people were still opposed to that, that would be a completely different thing.

But right now, today, the public is justified in not having confidence in the way this problem is being handled.

You agree with that, don't you?

Mr. HIRSCHHORN. Absolutely. I think the key word is the word "confidence," that there is a lack of confidence in the Government right now and that must be turned around.

Mr. GORE. And you think that lack of confidence is justified?

Mr. HIRSCHHORN. Yes.

Mr. GORE. Now, specifically, you say that the current regulations concerning landfill disposal of hazardous waste are totally and completely inadequate. Is that correct?

Mr. HIRSCHHORN. Yes. Again, one has to go into some technical detail. But, for example, what the public is interested in is to be protected. And the protection mechanism is what we refer to as the monitoring requirement, that is, you want to have some physical instruments out there, you want to have measurements being taken to discover whether or not you have releases of toxic constituents into the environment.

So monitoring is sort of your line of insurance, your safeguards for the public to know that their health and environment is being protected. For example, our study focused considerably on the monitoring requirements that EPA has out for land disposal facilities. We found that the monitored requirements, that is, what the operators must do in testing ground water or testing emissions into the air, that these requirements technically are not adequate.

Mr. GORE. Now, you say second of all that there are alternatives

to disposal technologies that are available today. They are not off in the future requiring more research and development. They are ready today. They are available.

Mr. HIRSCHHORN. Of course, we can always use more research and development. But I want to stress that there appear to be enough alternatives today to get on with the problem and shift the emphasis away from land disposal. I have no doubt. I get phone calls all the time from inventors and entrepreneurs all over the country telling me—and I listen to them in great detail—that they are working on still more techniques and alternatives. And I have a great deal of confidence in the American inventors and entrepreneurs.

We have seen that many times at OTA. Given the right market conditions and the right Government framework these people will introduce these alternatives into the marketplace.

Mr. GORE. Now, one of the reasons these alternative disposal techniques are not used is that there are no economic incentives to stimulate their use.

And, specifically, addressing two incentives, industries or companies that want to behave irresponsibly and cut corners can actually get a competitive advantage over competitors that are trying to use the best available technology, if the regulations are not being enforced and if the regulations are totally inadequate.

Second, the Government fee that is collected to fill up the Superfund in order to provide that money to clean up the consequences of poor hazardous waste disposals, that fee is collected in a way that doesn't provide the proper economic incentive.

Now, I am recapitulating what you said a little here, but let me ask you to correct my understanding of it, if it is wrong.

Mr. HIRSCHHORN. I——

Mr. GORE. Wait just a second.

Currently, if you have a factory and in one end of the factory the raw materials come in, and out the other end of the factory come the products and the wastes. The fee is now put on the raw materials. So if a company reduces the amount of waste that is generated, they still have to pay the same fee.

If we change the way the fee was collected and put the fee on the waste itself, then they would have extra incentive or in some cases incentive for the first time to reduce the amount of waste that they generate.

Second, it would give us the opportunity to have a graduated set of fees and charge more for irresponsible or less responsible treatment of the waste and charge less for better disposal technologies and eliminate the fee altogether if the waste was going to be recycled so you could get the forces of the marketplace working for you instead of working against you.

Is that a brief summary of what your recommendation is?

Mr. HIRSCHHORN. Absolutely. I would just amplify on one fine point that I think the public can understand.

Currently, under Superfund, this fee on the feedstocks is pretty obvious to people, I think, that there is no logical connection between these chemical and petroleum feedstocks and either the amount of hazardous waste a particular company generates or on

the type of waste they generate or on the quality of their management

So, as you correctly say, that the company today, a chemical company, for example, that chooses to reduce its waste generation by putting some changes in its manufacturing process, or that chooses to spend $200 a ton on incineration rather than their competitor that may produce more waste but that may pay only $50 a ton for land disposal that that company who is incinerating perhaps less weight is at an economic disadvantage in the marketplace. And this is really established through the Federal system that exists today.

Mr. GORE. Well, now, you are saying that there are more sites being created every single day. As you were saying that the list of 15,000 sites around the country was expanding every single month, I almost interrupted you to tell you that here in Tennessee that list is expanding almost every single week.

But in the addition to the new ones that are being discovered, you are telling us that more brand new sites are being created every single day under the current laws; right?

Mr. HIRSCHHORN. Absolutely. Again, we tend to be, of course, talking about hazardous waste sites. There are tens of thousands of sanitary landfills. These are landfills that receive normal household garbage, normal types of solid and municipal and industrial company wastes. Legally, these sanitary landfills are receiving hazardous wastes.

And I want to emphasize that in any particular community, particularly if there is industry there, you may have tens or hundreds of so-called small generators of hazardous waste each of which legally can send up to a metric ton a month of hazardous waste. That's 2,200 pounds a month from each small generator.

You may have tens or hundreds of small generators sending the most toxic wastes to sanitary landfills. And these sanitary landfills do not have so-called liners to protect ground water. They do not have monitoring requirements to meet.

This is just one example. There are other examples.

For example, the burning of hazardous waste as fuel in industrial and residential boilers currently is not regulated. And I also want to pick up on the point made by Dr. Overcash that——

Mr. GORE. Before you do that, let me ask a question in response to that.

Let's suppose that a company produced 2,200 pounds of dioxin every month, 73 pounds a day. Could they legally dump that into a city dump or sanitary landfill?

Mr. HIRSCHHORN. Of course, some States recognizing the inadequacies of Federal regulations have introduced more stringent regulations.

Mr. GORE. In the absence of State and Federal law?

Mr. HIRSCHHORN. Yes. In the absence of the State initiative to be more stringent than the EPA, yes, that can go on.

Mr. GORE. So, legally, up to 2,000 pounds a month of something as poisonous as dioxin could be just poured into a city dump with no regulatory problem, no legal problem?

Mr. HIRSCHHORN. Well, you have actually doubled the problem inadvertently, because there are things like dioxin that are not even regulated now.

One of the other loopholes currently in RCRA is that there are many toxic materials that are not now defined and regulated as hazardous waste. And in our report we know that the test used by the EPA to help define what is a toxic waste is, from a technical point of view, ineffective.

There are two ways of regulating waste. EPA initially came out with lists of ways, and then they had certain kinds of tests that might reveal the hazardous waste.

One of the things our study noted is that there are some toxic materials that are not listed by EPA and that will not show up as hazardous or toxic through the EPA test, so that you still have today things like dioxin and other organic toxics that are not necessarily regulated at all.

Mr. GORE. On the other hand, there are a lot of substances that have a relatively low degree of hazard that are labeled hazardous. They have this one broad category and paint thinner goes in and dioxin doesn't necessarily go in.

Mr. HIRSCHHORN. Absolutely. In 1976 when RCRA was passed, one of the issues discussed was the so-called degree of hazard concept: Should you distinguish different types of hazardous waste.

One of the problems that the public has, and they didn't cause the problem, EPA caused the problem, because EPA chose not to distinguish among hazardous wastes according to their degree of hazard. I don't blame the public for thinking that all hazardous wastes are equally lethal and toxic. The fact of the matter is not all hazardous wastes are like dioxin and other such compounds.

So that introducing some sort of way to distinguish among hazard levels is an important step to educating the public so that they won't feel equally threatened by all these waste situations.

Mr. GORE. Well, sometimes I think we need to educate the Government a lot more than we need to educate the public. I think they are ahead of the Government on this one.

To add to the problem, a lot of this waste, low hazard and high hazard, is all mixed in together so that you have a chemical soup that results that has a much higher volume than it would otherwise have.

One of your recommendations, and as well recommended by NAS, is that we separate different substances according to the degree of hazard and treat each one of them appropriately, rather than having industry dump it all together and have a very high volume of material that has highly toxic components in it and is a much larger volume than it needs to be.

Is that correct?

Mr. HIRSCHHORN. Absolutely. The lowest cost alternative to reduce the amount of most hazardous waste, is what we call segregation or separation at the source, separate different kinds of wastes so that you end up with a very small volume, perhaps, of the most hazardous material. And it's just good engineering practice to do this.

Again, it may not be going on to the fullest extent possible because of the disincentives in the regulations, because companies just may require some capital to carry this out. They may need some help.

Mr. GORE. One final question and then I will turn to my colleagues.

Professor Overcash, on page 9 of the longer version of the NAS report, you say: "The burden of proof as to the reasonable absence of potential environmental damage caused by such use"—referring to a disposal technology—"the burden of proof should rest primarily with the waste disposer, rather than with private environmental organizations or Government agencies."

Now, I interpret that to mean that where there is a lack of public confidence, where there is uncertainty about the environmental effects of disposal techniques, the person disposing of chemical waste ought to have the burden of proof of showing that there isn't going to be damage that will come from that disposal, rather than putting the burden on the public to prove that there is damage. Is that essentially what you are saying?

Mr. OVERCASH. We could expand on that slightly. When we refer to the generators, we are really referring to the generators and the Government which regulates it in saying that the burden should not be on relatively less technically astute people to go out and try to sort out what might be their effects.

So I don't believe that we are trying to shift that responsibility to a specific industry, but instead to our entire apparatus.

I would like to add to your earlier comments by stating that the segregation technology, if you would, would be not necessarily along the lines of level of hazard but potentially along the lines of the types of technologies that you would use to treat the material, and hence more on the orientation of chemical class rather than level of hazard.

I would further add that it is my understanding that EPA is, in fact, moving in that direction with respect to the kinds of detailed studies that they have underway. So I think that we are probably coming to a similar point in time. The question is when.

Mr. GORE. Thank you very much.

Congressman Jones.

Mr. JONES. Thank you very much, Mr. Chairman. I have enjoyed the reports of both of you witnesses. I think that you have developed some oversight here that is worth a great deal not only to your committee, Al, but to the public here in general.

I think one outstanding statement that has been made that I agree with totally, being on the outside as far as the committee work is concerned, but being an observer also, is that one of you said that the lack of public confidence today in what the Federal Government has been doing is certainly an outstanding feature as far as hazardous waste is concerned.

I believe that thoroughly because we come in contact with these problems each day. For some reason or other, no one has been willing or been able to sell this idea to the public as being as dangerous as it is, even with the media and all others who participate in it.

I have one question only I am going to ask because I know time is important and you have covered the subject very well.

To what extent do the existing EPA landfill regulations concerning land disposal of toxic waste discourage the use of alternative

technologies? I will ask that to either one of you, Mr. Hirschhorn, or I will hear from both of you.

Mr. HIRSCHHORN. Well, what we are saying is that these regulations that cover landfills really don't ask enough of the landfill operator. If the regulations were more stringent, asked more of the landfill operator to protect public health and environment, very clearly the cost to that landfill operator should go up.

It's a very difficult thing to bring out the numbers to prove to somebody, but I think those of us who have studied the problem for a long time feel that if one could make the regulations more technically effective and actually place a greater burden on landfill operators, that the operators would face a much higher cost and that is that eventually the cost of land disposal, if the regulations were enforced, would be equal to or greater than the cost of alternatives, such as incineration or chemical treatment or whatever.

Right now these regulations are not effective in protecting the public and are not leading to the correct level of cost to the landfill operators. But I do want to stress that the real important issue is not really economics clearly, it's public trust that the Government regulations are protecting public health in the environment. That is really what the issue is all about here.

It has nothing to do with being against industry or wanting somehow to increase costs just for that sake alone. The real issue is whether the regulations for landfills in particular really will protect the public.

I am just saying that our technical analysis, never mind the economic analysis, but the technical analysis of the regulations lead us to believe that the protection of the public is not assured yet.

Mr. JONES. One other comment and I will close, Al.

I certainly endorse, from what I know about what you had to say about change in the tax incentive that you had in mind, to me, if I were in business and had a problem as far as toxic waste is concerned, and you know a lot more than I, that the tax incentive would carry a lot of weight.

Mr. GORE. I appreciate that, and I think we have a chance to pass the legislation in this session of Congress.

As Mr. Hirschhorn said, originally the decision was made to put the fee on the raw materials because they felt it would make it easier to collect the fees since there were so few manufacturers of those raw materials.

Second, there was a concern that if the fee was on the waste disposed of it would actually encourage the improper disposal of hazardous wastes at a time when we were already having a problem with the so-called midnight dumpers.

Now that we have better information about the number and location of waste generators and now that we have a regulatory team in place to penalize the improper disposal of hazardous waste, it is possible to move to this more sensible fee formulation, which I hope we will be able to do in the Congress.

I would like to recognize Congressman Durbin.

Mr. DURBIN. Thank you very much.

Mr. Overcash, I believe you have testified that there are, in your mind, cheaper alternatives available now, better alternatives to landfill that just aren't being used. Is that your testimony?

Mr. OVERCASH. That is correct.

Mr. DURBIN. I am wondering, let's exclude for a minute from our discussion here the midnight dumpers, the irresponsible companies. Let's talk about those companies that, frankly, are so large that the likelihood of their going bankrupt and disappearing if they faced a major lawsuit is not one that they cherish and they want to try to do the right thing.

It's becoming more and more expensive for them, is it not, on a year-to-year basis to use a landfill process?

Mr. OVERCASH. The prices of putting materials in landfills does go up on an annual basis. The extent to that, I am not quite sure. It does represent a significant cost that goes along with their cost of cleaning up the air and the water which are also probably more significant in actual dollars.

Mr. DURBIN. Have either of you gentlemen seen any indication that that level of industry is looking to these alternative means of disposal, other than landfills?

Mr. OVERCASH. I am aware of several corporations who simply haven't made the observation that I originally quoted, namely, the liability of adopting a landfill policy, that is, having their own or putting their waste in somebody else's landfill, is sufficiently high that they don't want to be on the 5 o'clock news.

They don't want to be forced to go dig barrels up at a cost of a hundred times, et cetera, and that they are, in fact, making the decision to essentially eliminate that technology or reduce it to its smallest possibility. So I would say to the extent that they lead, in the sense that they have the capability of making that decision in an economic context, that this process is going on.

However, there is a certain amount of altruism in that they have to believe that it, in fact, is going to be more expensive and then convince management that it is, in fact, the correct way to approach the problem.

You find a big difference in response in a company whose hands have been slapped several times versus one which has not.

So I think there is a variety of both public issues relative to corporate citizenship, et cetera, as well as the economic liability consideration, which are indeed moving us toward these other alternatives.

Mr. DURBIN. Go ahead, Mr. Hirschhorn.

Mr. HIRSCHHORN. Just to put it in perspective, the problem may not be very large or great, for example, for Fortune 100 corporations that are very concerned about their public image, corporations that have a very strong technological base. Remember, there are some at least 60,000 hazardous waste generators.

The problem is: There are thousands and thousands of smaller companies, and those decisionmakers faced with the charge of spending $50 a ton or $20 a ton versus spending twice that or more to do it the right you, you just have to admit, are likely to be driven by the economics.

Mr. DURBIN. Do either of you have a feeling for what volume is being handled in a responsible manner now of the 60,000 generators and the hazardous waste that they might generate?

Mr. HIRSCHHORN. Well, that's a very difficult thing to quantify.

It's interesting that early EPA data indicated that something like only 10 percent of waste were being properly managed.

It seems that if we think that up to 80 percent of waste is being land disposed, that that number clearly is too high.

How much, you know, should be land disposed is open to question. But I am sure it's a small fraction of what we now see being land disposed. But I also want to emphasize that we shouldn't forget about waste reduction.

One of the greatest inadequacies of the regulatory framework is that it never has put any attention on reducing waste to begin with, and we should not accept as a given that we have to always generate large amounts of hazardous waste. The whole national system has to move more toward waste reduction at the source as well as moving toward treatment alternatives.

Mr. GORE. Will my colleague yield?

Mr. DURBIN. Certainly.

Mr. GORE. On that point, the figures you produce indicate that we are generating, each year in the United States, roughly 15 times the body weight of every single man, woman, and child in the United States—that amount of hazardous waste each year. And clearly that is an unreasonable amount being generated in the first place. We ought to be reducing the amount that we produce. Excuse me.

Mr. DURBIN. Mr. Overcash, you made an interesting observation about Denmark, that 10 to 15 percent of their hazardous waste goes into perpetual storage. What is the comparable figure in the United States?

Mr. OVERCASH. The comparable figure would be the 80- to 90-percent figure.

Mr. DURBIN. That we put into it?

Mr. OVERCASH. That we put into it. In other words, basically what goes into their landfills are low hazard materials, slightly contaminated, predominantly inorganic materials, and some other problem chemicals for which treatment is very difficult.

It is interesting that they do not just use clay lined, liner facilities as landfill, they also have access to salt domes or the ultra stable facilities, and even though they have to pay for that, it belongs to another country, that is the method of choice.

Those kinds of facilities, those geologic structures do exist in the Untied States and in very ample quantity.

Mr. HIRSCHHORN. If I just might make a quick comment. I am a little bit more skeptical and reserved about holding up European practices as being so much better than American practices. I think we ought to realize that there are some very real differences between a country like Denmark in terms of land area available, between the nature and the structure of their industry and their political institutions.

I think a lot of these European experiences sound a lot better off than they really are, and I don't think they are applicable in all cases to the U.S. situation.

That isn't to say that we can't learn things from other countries. But, in fact, for the most part, the Europeans do not have technologies that are unavailable to us, and I think we have to remember

that American industrial bases are a lot different than what you find in a place like Denmark, for example.

Mr. OVERCASH. You asked for areas in which there is disagreement. I understand that the NAS Committee does disagree with the OTA report in that regard.

Mr. DURBIN. I would just comment that a few years ago I was on a Presidential Commission on Radioactive Waste Management, and we started talking in terms of what to do with high level radioactive wastes.

We had our own theories of perpetual storage and perpetual eternal storage, and on and on. And when you start talking in terms of 5 to 10 centuries I sometimes feel that perhaps it's a little ambitious of us to suggest that we know exactly what is going to happen in this world and happen to what we are storing over the long haul.

What I am trying to draw down to a question is a consideration of what percentage of this hazardous waste will we necessarily be committing to something that we now term perpetual storage. What is realistic, assuming the best in our technological development?

Mr. OVERCASH. I would like to comment on that.

I believe that the number, when you go back and look at what could go through incinerators, what could go through treatment technology, detoxification which could be eliminated in the plant and the remainder, which is predominantly inorganic low hazardous material, then it's probably on the order of 10 percent. It's not close to what we are generating today, so it's very much down.

Now, whether it's 10 percent, 6, 1, 20 percent, I honestly don't know. And the committee was not able to arrive at that number, either.

Mr. DURBIN. Do either of you have an opinion as to when we reach this perpetual storage, 10 percent, 15 percent, or so, whether we are talking about a commercial venture regulated by the Government or something that is actually owned and monitored by the Federal Government?

Mr. OVERCASH. I think that the method of managing the facility is probably far less important than having collected the user fees to assure that whoever manages it has the capital to do that over the long term.

Mr. DURBIN. Night watchman for 10 centuries.

Mr. OVERCASH. That's a long time.

Mr. DURBIN. It is going to be an expensive item.

What about the suggestion that since so many States have moved toward banning landfills that we should consider some Federal legislation, either limiting the number of landfills or tighter regulations or phase out of the landfill approach? Do either of you have any comments on that?

Mr. HIRSCHHORN. We have addressed that point in our report. Again, looking at it in a balanced way, it's very clear that it makes some sense to prohibit land disposal for some of the most hazardous and most toxic wastes, and we do suggest that in one of our policy options.

I do caution people, though, because it's very easy to get into a position where you want to ban all landfilling or all land disposal

or things that are legally called hazardous wastes. And, again, they are not all equally lethal, they are not all toxic, in fact.

So I think it's comparable to think of some listing mechanism. Certainly, it a short-term solution one can conceive. In fact, some States, by the way, a number of States have already done this. They have lists of hazardous wastes which clearly should not be put into the land, and one can take that approach. There is sufficient data now on health effects of these toxic materials to do that.

Mr. OVERCASH. Our committee concluded that we could not exist as a country without some form of perpetual storage. There simply are always irreversable residues. And the question of how to deal with those and whether or not we have the best choice of that right now is really the issue.

So, banning of landfills, I think, simply moves toward zero risk, zero discharge concepts, which simply are not tenable.

Mr. DURBIN. Thank you very much, gentlemen.

Mr. GORE. One of the things that has happened right before this hearing is that the landfill in Alabama where I believe 80 percent of Tennessee's hazardous wastes have been taken, was just closed yesterday on a temporary basis, partly because of a national controversy involving the company that is running it.

Every indication is that within a week or 2 weeks that landfill in Alabama will open up again.

But let me just ask you all a hypothetical question: Suppose it became impossible for the State of Tennessee to dump its waste in Alabama and Louisiana: How soon could the kinds of alternatives you are discussing, Mr. Hirschhorn, be available? I know that they are available scientifically. They have been proven. They work.

But from a practical economic point of view, how soon could they be available to dispose of the toxic waste which should really not be put into landfills?

Mr. HIRSCHHORN. Well, one of my initial reactions is, and we have data in the report on this, in fact, EPA has collected this data, that there is unused capacity at treatment facilities right now in the United States and there has been for some time.

It is not the total solution. Clearly, you have regional problems. But I would say, yes, there are chemical treatment facilities, incineration facilities nationwide which are not being used to their ultimate capacity right now.

So it is conceivable that a company that could not land dispose of their waste could send their waste to a treatment facility.

Their first reaction, of course, would be, my God, that will cost maybe twice as much or three times as much, so you have an economic problem. And again you may not have sufficient capacity locally and you have to worry about transportaion of waste.

But it is conceivable that you may have interim solutions, aboveground storage for a year or two while you can build more capacity treatment. Things like that are feasible. And I am not talking about ultra long-term storage. But very retrievable aboveground storage is a possibility.

But I do want to emphasize that EPA has collected data on unused capacity in treatment facilities, because of, still, the motivation to use land disposal, companies have not been making out very well with new treatment facilities.

Mr. GORE. Well, I can see where there might be unused capacity and yet that unused capacity might be quickly overwhelmed if there were a wholesale shift from landfill disposal to the alternative technologies.

But you are saying that an interim step to take up the slack might be temporary aboveground storage pending the expansion of the capacity in these alternative disposal technologies.

Both of you have said that you think there are significant problems with the nationwide banning on all landfill disposal. What about a nationwide ban on the landfill disposal of those toxic wastes that we can agree should never be put into a landfill? Would such a national law make sense?

Mr. HIRSCHHORN. I think so, and as I have indicated, several States have already done this. They usually give advance warning. I mean, it doesn't get implemented the day after legislation is passed, but there usually is some time period to give industry enough chance to make arrangements to find a treatment facility, such as incinerator or chemical treatment, or to contemplate investing money to build a facility.

I want to emphasize, I have been told many times, that there is private capital ready and waiting to invest in new treatment facilities, once they are assured that Government policies exist which will not distort and play games with the marketplace. That is, once they know that people will use their facilities private capital will be invested.

Mr. GORE. Did you want to comment, Professor Overcash?

Mr. OVERCASH. I would only add to that, that those organizations willing to invest that capital are also concerned about the public opposition to such facilities, which is outside of the regulatory context, and that is an area that indeed can be regulated. Somebody has to be educated.

Mr. GORE. You mean public opposition to the alternative technology?

Mr. OVERCASH. To the alternative technology.

Mr. GORE. Well, I guess that's a good point. But I have had some experience with that.

In my congressional district an alternative disposal technology was introduced by a private business, and the local community had a ribbon cutting ceremony and it was accepted quite well and provided some jobs. The public was given some confidence that there really was no unreasonable hazard associated with it.

Now, a lot of work went into that. But it seems to me that we ought not to, you gentlemen ought not to misjudge the wisdom of the public.

I mean, they are right in their current opposition, but if the information is available the word gets around pretty fast.

Now, in that context, let me ask you this question: Can we state with confidence that there are indeed wastes that can be safely disposed of in landfills that are currently labeled hazardous under the Federal definition of hazardous waste?

Mr. Hirschhorn.

Mr. HIRSCHHORN. I believe yes, although, again, we have some reservations about the current regulations. Again, for example, there are nontoxic hazardous wastes. Sometimes they are in relatively large quantities.

Mr. GORE. Give me an example.

Mr. HIRSCHHORN. Well, there are wastes that may be acid or bases. These are chemical reactive types of liquids often that don't have toxic components. They just would burn you or otherwise affect you in——

Mr. GORE. What if they got in the gound water?

Mr. HIRSCHHORN. They may cause problems there, but again——

Mr. GORE. Well, now, wait a mintue.

Mr. HIRSCHHORN. Let me make one statement to sort of put this in perspective.

There is no substitute for a well-designed, well-located facility, whether it be a land disposal facility or a treatment facility. Part of the problem now is that you have some older land disposal facilities that were designed and located before these regulations and current knowledge ever existed, so you have a big difference in the quality of land disposal facilities around the Nation.

Some of these are reasonably located. They would not threaten ground water.

Mr. GORE. But let me just say that if they may cause a problem for the ground water, you know, that is a serious problem that is just not going to be ignored.

Mr. HIRSCHHORN. But, again, nontoxic hazardous wastes don't pose the same threats in ground water as toxics.

Mr. GORE. Well, give me an example.

Mr. HIRSCHHORN. Well, again, there are caustic types of hazardous wastes, dilute solutions that have some characteristics which do not necessarily have anything in them like dioxin or anything like that of PCB's. They are simply legally hazardous for other characteristics. They don't necessarily threaten ground water.

And when we say land disposal I do want to emphasize there are things other than landfills. For example, there are deep injection wells, which sometimes are very reasonably located, and if used for the appropriate wastes seem a reasonable alternative.

Again, I just would make this general statement with regard to treatment facilities also, that a well-designed, located, and regulated treatment facility for hazardous waste is really no different than any kind faced in industrial activity. And I think you are right that the public can be made aware of this and educated so that they view it, again, as an ordinary type of industrial activity that really offers the same levels of acceptable risk, not zero risk, but——

Mr. GORE. Again, it's not so much education as confidence that the government has been educated and that industry has become educated and that they are doing the right thing in disposing of the waste properly.

You bring up the idea of hazardous waste intensiveness, and I guess you foresee a time when people might be aware of the fact that some plastic product was associated with the production of so many pounds of hazardous wastes and that eventually that might provide some signals to the marketplace to cut down on the amount generated.

Is that sort of what you are getting at there?

Mr. HIRSCHHORN. Absolutely, in the same way that the public has become more aware of the energy intensiveness of products that they buy or the problem of normal refuse being formed.

Mr. GORE. Well, I have no idea how much hazardous waste is associated with the production of something like this. How am I going to find out?

Mr. HIRSCHHORN. Well, it's interesting because the Government, you might have thought the Government would have done at least a study on this. We are not aware of any study by anyone to reveal this kind of information, and I would suggest that it would be a very interesting and appropriate Government study to help find out that data to relate products to hazardous waste and help educate everyone, including the public.

Mr. GORE. That sounds like another project you might be interested in.

Mr. HIRSCHHORN. Well, academics might be more interested.

Mr. GORE. OK. Gentlemen, I would like to thank you very much for getting us off to a good start here this morning.

We might have some additional questions in writing for the record if that would be OK with you. But I found your testimony very, very interesting and we appreciate your appearance here today.

Thank you.

Our second panel of witnesses we would like to invite to come to the witness table now is made up of Dr. Michael Bruner, assistant commissioner of the Tennessee Department of Public Health, Penny Harrington, attorney with the Environmental Action Fund in Nashville, and Bobby Dyer, county executive in Henderson County in Lexington, Tenn.

Let me state for the record that we had hoped to have joining us now also the president of the Tennessee Manufacturers Association, and I am disappointed that he called last night and canceled out his appearance here today.

But I understand that this hearing is scheduled at a time when the Tennessee State Legislature is in an extremely active phase. Mr. Witt and the TMA have a number of important bills in which they are quite interested before the Tennessee State Legislature, and he was required to appear there, and we excused him from this session.

We will ask that his prepared statement be provided to the subcommittee for inclusion in the record, and perhaps we will have a chance to talk with him or a representative of the TMA at the second hearing in this series.

Mr. Witt's statement will be inserted at this point.

[The prepared statement of Mr. Witt follows:]

STATEMENT

OF

CARTER H. WITT, PRESIDENT

TENNESSEE MANUFACTURERS ASSOCIATION

NASHVILLE, TENNESSEE

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE, I AM CARTER H. WITT, PRESIDENT OF THE TENNESSEE MANUFACTURERS ASSOCIATION LOCATED IN NASHVILLE, TENNESSEE.

WITH THE COMMITTEE'S INDULGENCE ALLOW ME A FEW MOMENTS TO INTRODUCE THE ASSOCIATION I REPRESENT. FOUNDED IN 1912 THE TENNESSEE MANUFACTURERS ASSOCIATION AND ITS CURRENT STATEWIDE MEMBERSHIP OF ABOUT 800 PLANT LOCATIONS ACROSS TENNESSEE HAS BEEN A DRIVING FORCE IN CREATING THE POSITIVE BUSINESS CLIMATE TENNESSEE EMPLOYERS OPERATE WITHIN.

FOR THE PURPOSES OF THIS HEARING, LET ME SINGLE OUT ONE ELEMENT OF THE MANY FACETS OF PUBLIC POLICY WHICH AS A COMPOSITE FORMULATE A STATE'S BUSINESS CLIMATE. I AM REFERRING TO THE COMMITMENT TMA MADE YEARS AGO REGARDING ENVIRONMENTAL INVOLVEMENT. IN THE EARLY 1960'S, TMA ESTABLISHED ITS ENVIRONMENT COMMITTEE. IT'S BASIC PURPOSE WAS TO ASSIST THE DEVELOPMENT OF EFFECTIVE LEGISLATION AND REGULATION WHICH WOULD IMPLEMENT OUR ASSOCIATION VIEWPOINT THAT EFFECTIVE STATE-RUN ENVIRONMENT PROGRAMS ARE ESSENTIAL TO A STATE'S BUSINESS CLIMATE.

OUR EFFORTS OVER THE YEARS HOPEFULLY HAVE BEEN VIEWED BY THE PUBLIC AS POSITIVE CONTRIBUTIONS TO THE PROTECTION OF THE PUBLIC AND ENVIRONMENT.

SPECIFICALLY, OUR ASSOCIATION ENCOURAGED AND ASSISTED THE DEVELOPMENT OF STATE LEGISLATION IN 1977, 1979, 1980 AND AGAIN IN 1983 TO IMPLEMENT AN EFFECTIVE HAZARDOUS WASTE MANAGEMENT PROGRAM FOR TENNESSEE. THIS EFFORT WAS MADE TO ESTABLISH "CRADLE-TO-THE-GRAVE" CONTROLS FOR HAZARDOUS WASTE ALIKE THE INTENT OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AT THE FEDERAL LEVEL.

AT THIS PRESENT MOMENT IN 1983 WE ARE SUPPORTING LEGISLATION DEVELOPED BY OUR GENERAL ASSEMBLY'S JOINT STUDY COMMITTEE ON HAZARDOUS WASTE. THIS LEGISLATION IS NOW MAKING ITS WAY THROUGH THE COMMITTEE PROCESS. IN GENERAL, THIS LEGISLATION DOES FOUR IMPORTANT THINGS:

(1) CREATES SWEEPING LEGAL AUTHORITY FOR STATE PUBLIC HEALTH AUTHORITIES,

(2) PROVIDES A FUND OF $3-5 MILLION DOLLARS FOR REMEDIAL CLEAN-UP ACTIONS,

(3) PROVIDES A FUND NECESSARY TO ESTABLISH ELIGIBILITY FOR FEDERAL SUPERFUND MONIES,

(4) PROVIDES AN INCENTIVE FUND OF UP TO $2,000,000 FOR A COMMUNITY WILLING TO ACCEPT A COMMERCIAL LANDFILL FACILITY WHICH MUST ALSO HAVE THERMAL DESTRUCTION, RECYCLING AND RECOVERY CAPABILITY.

MR. CHAIRMAN, THIS BACKGROUND LEADS ME TO WHERE WE STAND TODAY IN TENNESSEE. I THINK I CAN BEST ILLUSTRATE THAT POSITION BY CITING SEVERAL KEY FACTORS:

* TENNESSEE WILL SOON HAVE IN PLACE ALL THE NECESSARY LEGAL MECHANISMS TO DEAL WITH PRESENT AND PAST DISPOSAL PRACTICES.
* TENNESSEE OFTEN CITED AS THE NINTH LARGEST GENERATING STATE OF HAZARDOUS WASTE HAS AS CORPORATE CITIZENS MANY FINE CHEMICAL MANUFACTURERS, AS WELL AS, OTHER GENERATING INDUSTRIES. MANY OF THESE FIRMS HAVE PAID TENS OF MILLIONS OF DOLLARS INTO THE FEDERAL SUPERFUND ON FEEDSTOCK MATERIALS. QUITE CANDIDLY, WE

FEEL TENNESSEE SHOULD BE ENTITLED TO MORE OF THESE FUNDS PERHAPS THROUGH THE SECTION 3012 RCRA PROCESS. WE WOULD URGE THE CONGRESS TO PROVIDE MORE FUNDS TO THE STATE IN THIS MANNER. THE PRESENT ALLOCATION OF $372,000 TO TENNESSEE UNDER RCRA 3012 AUTHORIZATION IS INDEED INADEQUATE.

* TENNESSEE HAS NO PERMITTED COMMERCIAL LANDFILL FACILITY. OUR PROBLEM IS NO DIFFERENT THAN MOST ALL OTHER STATES.

PERHAPS THE POINT I'M TRYING TO MAKE OR THAT TENNESSEE MANUFACTURERS THROUGH TMA ARE TRYING TO MAKE IS THAT TENNESSEE MANUFACTURERS ARE TRYING TO DO THE RIGHT THING IN PRESERVING OUR RELATIVELY GOOD ENVIRONMENT THROUGH THE ACTIONS CITED ABOVE. NEVERTHELESS, THERE ARE EMPLOYERS WHO DEFY THESE EFFORTS AS CHARACTERIZED BY THE MEDIA ALMOST EVERY DAY. WE WANT THIS SUBCOMMITTEE AND THE PUBLIC HERE TODAY TO UNDERSTAND THAT THE TENNESSEE MANUFACTURERS ASSOCIATION DOES NOT SHIELD THOSE WHO DEFY LAW AND REGULATION IN DISPOSAL PRACTICES. WE WANT VIOLATORS PROSECUTED!

I ALSO WANT TO IMPLORE THIS DISTINGUISHED COMMITTEE TO UNDERSTAND THAT INCENTIVE MECHANISMS MUST BE ESTABLISHED TO ENCOURAGE RECYCLING, RECOVERY AND INCINERATION OF WASTES. AT THE ONSET OF TENNESSEE'S REGULATORY PROGRAM IN 1980, TMA TESTIFIED IN FAVOR OF A THREE-TIER WASTE CLASSIFICATION SYSTEM WHICH ESSENTIALLY WOULD MAXIMIZE PRESENT DISPOSAL FACILITY CAPACITY. UNDER THIS SYSTEM, STANDARDS COULD HAVE BEEN DEVISED TO ACHIEVE A DEGREE OF PROTECTION CONSISTENT WITH HAZARD POTENTIAL EXHIBITED. EPA WOULD NOT ADOPT THIS CONCEPT AT THE NATIONAL LEVEL. SUCH A SYSTEM WOULD HAVE ENCOURAGED EFFICIENT USE OF FACILITY RESOURCES AND WOULD STIMULATE RESOURCE RECOVERY AND INCINERATION TECHNIQUES.

AS LEGAL REQUIREMENTS FOR PROPER WASTE DISPOSAL BECOME MORE RESTRICTIVE, AND AS SOPHISTICATED AND COSTLY DISPOSAL TECHNOLOGIES ARE IMPLEMENTED, THE COST OF INDUSTRIAL WASTE DISPOSAL WILL INCREASE SIGNIFICANTLY. WITH THE RISE IN DISPOSAL COSTS, WASTE REDUCTION AND RECOVERY ECONOMICS WILL BECOME MORE ATTRACTIVE THAN DISPOSAL ECONOMICS IN AN INCREASING NUMBER OF INSTANCES. ADD TO THIS THE UPWARD SPIRALLING COST OF RESOURCES, EVEN MARGINAL RECOVERY TECHNOLOGIES MAY BECOME ECONOMICALLY ATTRACTIVE.

IT IS SHREWD FOR A BUSINESS OF ANY SIZE TO EVALUATE A WASTE RECOVERY INVESTMENT. WE ENCOURAGE THAT APPROACH BECAUSE PAST DISPOSAL TECHNOLOGY IS UNACCEPTABLE PUBLIC POLICY TODAY. THE COMMITTEE MIGHT BE INTERESTED TO KNOW THAT TMA CONDUCTS A FORMAL WASTE EXCHANGE CLEARINGHOUSE IN AN EFFORT TO REDUCE THE VOLUME OF WASTE IN TENNESSEE. OUR THEORY IS THAT ONE COMPANY'S WASTE MIGHT BE ANOTHER'S RAW MATERIAL.

THE GENERAL PUBLIC ACCEPTS THE NEED FOR TREATMENT AND DISPOSAL FACILITIES. THE PROBLEM IS THAT NO ONE WANTS ONE NEAR THEIR COMMUNITY. WHILE THAT POSITION IS UNDERSTANDABLE, WE MUST LOCATE FACILITIES SOMEWHERE. RCRA MANDATES PROPER TREATMENT AND DISPOSAL OF ALL HAZARDOUS WASTES, BUT RELATIVELY FEW APPROVED FACILITIES ARE PRESENTLY AVAILABLE TO DO THE JOB. MANY MORE PROCESSING CENTERS, INCINERATORS, AND SECURE LANDFILLS MUST BE ESTABLISHED QUICKLY, ESPECIALLY IN HEAVILY INDUSTRIALIZED STATES, IF RCRA IS TO BE CARRIED OUT. FAILURE TO DO SO WILL SLOW INDUSTRIAL OUTPUT AND INVITE THE KIND OF IMPROPER DISPOSAL THE LAW IS DESIGNED TO PREVENT.

IN CLOSING, MR. CHAIRMAN, LET ME ENCOURAGE THE SUBCOMMITTEE TO ALSO RECOMMEND THE EXAMINATION OF TAX CREDITS AS ONE MEASURE IN ENCOURAGING RECYCLING, RECOVERY AND INCINERATION TECHNIQUES. TAX CREDIT CONCEPTS MUST BE SUFFICIENT SO AS TO INDUCE GENERATORS OF WASTES TO INVEST IN NEEDED FACILITIES PROMPTLY.

LANDFILLING IS NOT THE ULTIMATE ANSWER TO ALL OF INDUSTRY'S PROBLEMS. IT IS A SHORT-RUN ALTERNATIVE WE MUST HAVE PROVIDING THE CONGRESS BEGINS WORK WITH INDUSTRY TO PROVIDE THE NECESSARY TAX CREDIT ARRANGEMENTS AND OTHER CONSIDERATIONS, WHICH WILL PROVIDE SUFFICIENT INDUCEMENT TO ALTER PRESENT DISPOSAL PRACTICES. WE MUST KEEP IN MIND THAT SOME INDUSTRY WASTES AND INCINERATION RESIDUALS MUST BE LANDFILLED.

THIS CONCLUDES MY STATEMENT, MR. CHAIRMAN. I WILL BE PLEASED TO ATTEMPT TO ANSWER QUESTIONS YOU MAY HAVE.

Mr. GORE. We will proceed with the witnesses in the order in which they are listed.

I want to particularly welcome County Executive Bob Dyer, who has played an important role in shaping this issue here in the State of Tennessee.

I am delighted to have had a chance to work with you, Mr. Dyer, and we will get to your testimony in just a minute.

We would like to start with Dr. Michael Bruner, assistant commissioner with the Tennessee Department of Public Health.

Dr. Bruner, we invite you to proceed.

STATEMENTS OF DR. MICHAEL BRUNER, ASSISTANT COMMISSIONER WITH THE TENNESSEE DEPARTMENT OF PUBLIC HEALTH; PENNY HARRINGTON, ATTORNEY ENVIRONMENTAL ACTION FUND; AND BOBBY DYER, COUNTY EXECUTIVE, HENDERSON COUNTY

Dr. BRUNER. Thank you very much, Congressman Gore and Congressman Durbin.

We appreciate being invited today, particularly, Congressman Durbin. I am a native of Illinois. I have lost my Yankee accent over 20 years.

Mr. DURBIN. I noticed that.

Dr. BRUNER. I have fond memories of being from Illinois.

I am Michael Bruner, the assistant commissioner of public health.

I have the responsibility for administering all the State regulatory programs in the environment, including air pollution, radiological health, water management, surface mining and solid waste management which includes hazardous waste.

My boss, Jim Word, acting commissioner of public health at this time sends his regards to you, Congressman Gore, for hosting this meeting and appreciation to you for your interest in this vital subject.

As you know, since we have been on tour with you on several trips in our State, you have gotten an eyewitness account of a number of sites in Tennessee. And one of your observations earlier in the hearing today was that the number keeps changing. We are aware of that.

Our present number that we are using is 265. Write that down, because by the time we get back there are new sites being reported daily.

Mr. GORE. Let me state for the record, Dr. Bruner, that I appreciate the assistance which you and your staff have provided this subcommittee in its investigation of hazardous waste dump sites in the State of Tennessee.

Your investigators have been kind enough to accompany me in a personal inspection tour of many of the sites throughout this State, and I appreciate that very much.

I wanted to state that for the record.

Dr. BRUNER. Thank you.

I would like to divert from my formal testimony for a moment and reflect on a couple of points that have been made, particularly the following point:

I was reviewing our records on the way from Nashville this morning and I was shocked at one observation from the records on the dump site that I would like to call your attention to. It is not a part of the formal testimony.

Of those 265 sites that we now have listed by our staff, 100 of those 265 sites are Federal agency sites. So even though I am guilty, and I think others are perhaps guilty, of having a single image of big industry with a black hat, I would like to call to your attention, and it was surprising to me when I looked at the 265 sites that we have listed, 100 of those sites are related to Federal agencies.

I believe there is something that you gentlemen could give us particular assistance in, looking at this with us.

Mr. GORE. Let me interrupt you real quick.

Dr. BRUNER. All right.

Mr. GORE. Are you saying that 100 of the 265 are owned by the Federal Government?

Dr. BRUNER. Yes.

Mr. GORE. And this is the Oak Ridge area you are speaking of?

Dr. BRUNER. This is from Memphis to Bristol, with two major Federal agencies. The specifics are available here for your review at a later moment in time. But it is particularly associated with the Department of Defense, which today seems to be a high roller, and the Department of——

Mr. GORE. We are not going to get into that now.

Dr. BRUNER. And the Department of Energy. And I suppose I do have a bias. There are three points, Mr. Chairman, and again these are my informal remarks not related to the formal text, but I would like to make three points regarding those sites.

One is a consistent lack of recognition of the large number of sites associated with Federal agencies.

The second point is one that you may have some influence over, and that is, when we are dealing with a Federal site there are consistently vague lines of authority between the Federal agency and the State agency, so that we get into a lot of gray areas of jurisdiction as to whether EPA has the authority and responsibility for the regulation and enforcement or whether it's the State agency.

We also get into situations where the various media programs like water and radiological health and hazardous wastes have cloudy lines of authority both at Federal levels and State levels.

My third point is: I would like your assistance in trying to clarify those lines of authority and also to give recognition to the Federal agency involved.

Mr. GORE. Let me interrupt you again there.

Are any of the Federal agency sites included on the Superfund list?

Dr. BRUNER. Negative. If we were, though, to list, you know how the listing was made on the Federal Superfund sites with the mitre ranking——

Mr. GORE. Yes.

Dr. BRUNER. Which some of us argue is not the best, but it's the best we have.

If we were to look at these 265 sites that I have mentioned and use simple gut level professional wisdom in ranking those sites, it would not be the 6 sites that are shown on the Superfund list, and some of the Federal sites would be among the 6.

Two to four of the sites that we consider the worst sites in Tennessee have a strong Federal identity.

Mr. GORE. Which are those?

Dr. BRUNER. The site that we consider the most serious associated with the Federal agency is Oak Ridge National Laboratories in Oak Ridge, Tenn.

Mr. GORE. And why isn't it on the Superfund?

Dr. BRUNER. The nature of the ranking system. As you know, one of the major factors in the ranking system had to do with the closeness to the vicinity of high population areas, like the site in the Jackson pit where you visited.

So the further away you get from a population center, the less likely the site will be on the Superfund list.

Mr. GORE. What is the second one?

Dr. BRUNER. A second site that we are very concerned about is Arnold Engineering Development Center of Tullahoma, Tenn.

This might also be an example of how a good theoretical model like the mitre ranking can have limited practical value, because, again, that particular site is in a rural area and has little impact on public water supply in heavy population areas.

So you have some bias associated with it which, in general, means that the formula used was health impact intensive and lack of environmental impact on ground water.

Mr. GORE. Dr. Bruner, I am advised that the problem is not with the mitre model. The problem is that this Administration, EPA, made a decision to prevent any Federal sites from being included in the Superfund list.

The Superfund list for the entire country includes no federally owned sites. So the problem is not in the mitre model.

I have problems with the mitre model also. But the problem is the EPA decided, arbitrarily and administratively, not to allow the inclusion of any Federal sites on the Superfund list.

Dr. BRUNER. Well, I am a little sensitive about double standards, and I have had to live with a few myself. But I have real difficulty in what I perceive as a double standard dealing with private industry and municipalities that seem to be catching most of the heat versus the Federal agency. And the Federal agencies that have significant environmental problems should be addressed, and I would like you to give that some consideration.

Mr. GORE. I certainly will, and I appreciate your comments.

Dr. BRUNER. Back to my formal text, ladies and gentlemen.

Mr. Word has been privileged to serve again as acting commissioner of public health. Mr. Word has been fortunate to have been named by the Governor as chairman of the Governor's Safe Growth Cabinet Council, which has been given the highest priority in hazardous waste this year. So we do speak both from a management and political view on our hazardous waste program.

According to our best information, Tennessee industry is annually producing 711,000 tons of waste material classified as hazardous. I want to, again, put tongue in cheek saying that no one knows, no one knows the volume of hazardous waste. Most of the figures that are talking about are very soft figures, at best good estimates. There is not an accurate detailed reporting system today.

Mr. GORE. If I may interrupt you again, I am sorry to do so.

There is such a discrepancy between the figure you use and the figure that the Office of Technology Assessment uses. I must ask you for a clarification.

You say that a Tennessee industry annually produces 711,000 tons of hazardous waste. The Office of Technology Assessment says that Tennessee is producing 4.3 million tons of hazardous waste annually based on a survey done of State records.

How do you account for the difference between that 711,000 that you use and the 4.3 million that the OTA study uses for Tennessee?

Dr. BRUNER. I don't know how the 4.3 million figure was arrived at. I know that our 711,000 was arrived at by actual reporting on Tennessee with the regulatory program.

But, again, I am not shocked that there would be a major discrepancy because of the softness of the report and——

Mr. GORE. The State provided those figures to the Office of Technology Assessment.

I am wondering whether the difference might be that the 711,000 tons is the amount that is disposed of offsite and that the remainder of the 4.3——

Ms. Harrington, do you have any light to shed on that?

Ms. HARRINGTON. When I first began working with the Environmental Action Fund and working with the Hazardous Waste Committee of the Tennessee General Assembly, we were informed by the department of public health that 4.3 was the correct figure. That was the latter part of November and the first part of December.

Shortly thereafter the figure was changed to 3 million. This was creating some difficulty, because we were trying to figure out how much a generator fee would produce.

I was informed by Mr. Sharber of the Tennessee Department of Public Health that that 1.3 million reduction was because the Environmental Protection Agency changed its definition of hazardous waste not to include waste ponds, which I understand are produced in deep mining. So that there was some redefinition that caused that reduction.

So we worked with the 3 million figure until some time in February, at which point the joint committee was informed that the figure was 711,000, which Mr. Bruner was discussing today.

And I understand that that further reduction came from the elimination of facilities, which had a 402 waste order permit, which I understand comes under the Clean Water Act rather than the hazardous waste. So that was redefinition which the Tennessee Department of Public Health adopted through our regulation system. And that is the explanation for the change.

It did cause a great deal of problem with the Tennessee Legislature trying to figure out how much money we could get.

Mr. GORE. Thank you very much. I appreciate your clarification.

Go ahead, Dr. Bruner.

Dr. BRUNER. The department is currently in the final stages of applying for delegation of authority from EPA to administer phase II A and B under subtitle C of RCRA. When the delegation is complete, we will have the authority to regulate storage and treatment facilities and hazardous waste incinerators in Tennessee. We have recently begun the process of applying for delegation for phase II-C, which applies to the permitting of waste landfill.

There are several companies in Tennessee today which successfully recycle or reuse their hazardous waste.

In my opinion, Mr. Chairman, one of the things that we are going to see, as pressure continues to be applied to the difficulty and the expense of disposing of waste, we are going to see private industry in major development of ways to redo and recycle hazardous waste.

I look forward to that occurring in Tennessee, and I am confident that it will. There is a major investment at this point in time in the major industries in Tennessee in this regard. There are more industries which participate in waste exchanges, such as the one administered by the Tennessee Manufacturing Association. These projects help reduce the amount of waste which must ultimately be disposed of.

Tennessee law currently provides incentives for recycling to generators of hazardous waste. The rules and regulations of the Tennessee Hazardous Waste Management Act provide that a hazardous waste may be exempted from certain requirements and from fees if it is being beneficially used or recycled or legitimately recycled or reclaimed, or if it is being accumulated, stored or treated prior to recycling or recovery.

The Department today has received 23 petitions for exemptions under this rule. Nine have been approved, one denied, and the remainder are in process.

The hazardous waste management fee, which is assessed on generators of hazardous waste under this act, provides an incentive in itself for generators to reduce the volume of hazardous waste or to recycle it completely.

The State of Tennessee recognizes that it has the responsibility to further encourage the utilization of alternatives other than land disposal.

Over a year ago Governor Alexander charged his safe growth team to make recommendations to him for State action in three areas: The cleanup of abandoned hazardous waste dump sites; the procedures for locating a legal and safe hazardous waste disposal facility; and ways in which the State can encourage recycling and other alternatives to land disposals.

The safe growth hazardous waste task force, which was established to address these issues, included representatives from industry, environmental groups and State government.

The task force presented its recommendation to Governor Alexander and to the team on November 22, 1982. The section of the report dealing with recycling reads in part:

> The recycling committee operated from the premise that land disposal of hazardous waste is the least desirable legal disposal alternative from the standpoint of environmental integrity and public health. The committee attempted to identify ways to create incentives for generators of hazardous wastes to (a) reduce the amount of waste generated by changing the production process or product; (b) recover reusable components from the waste stream for recycling or reuse, (c) render waste materials nonhazardous; (d) destroy hazardous waste through high temperature incinerations or, finally, (e) solidify or stabilize residuals prior to landfilling.

Many of the recommendations of the safe growth task force are being implemented by the current administration. We are working closely with the joint legislative committee, chaired by Representative Ray Johnson, on legislation now pending in the general assembly, which provides for procedures for establishing a hazardous waste disposal facility and for the cleanup of abandoned dump sites.

There are a number of places in the bill as it is now drafted which encourage alternatives to landfilling as a method of disposal. First, the bill states that:

> It is the policy of the State of Tennessee to one, emphasize alternatives to land disposals of hazardous wastes, as is practicable; two, the fees which will be used to establish and maintain a remedial action fund are assessed on generation of hazardous waste, thereby encouraging source reduction; and three, hazardous wastes which are beneficially used or reused or legitimately recycled or reclaimed are exempt from the fee assessment.
>
> The bill also provides for the establishment of a responsible waste disposal incentive fund to be awarded to the first local government which agrees to accept a commercial disposal facility meeting certain requirements within its jurisdiction. In order to be eligible to receive the award, the facility must be multipurpose with capability for advanced technology, high temperature, thermal treatment as well as landfill.
>
> The host community is also empowered to levy an additional fee on wastes disposed at the facility; the stated maximum amount for fees on land disposal of wastes is double that allowed on treatment of wastes.
>
> Finally, the bill directs that a State hazardous waste management fee levied on the commercial facility shall be structured to encourage the treatment, reduction and reclamation of hazardous wastes.

In addition, an additional recommendation of the hazardous waste safe growth task force is currently being proposed in the gen-

eral assembly in the form of an amendment to the Hazardous Waste Management Act.

This amendment, if passed, will direct the solid waste board to promulgate rules to restrict or prohibit burial of certain wastes which were mentioned earlier in your hearing, the waste, because of its high toxicity, tendency to leach or migrate or characteristics which represent an unusually high danger to the public health and safety of the environment; an alternative to land disposal which is both technologically and economically feasible.

The safe growth task force has also committed funds to undertake a study of tax laws to explore ways in which possible reductions, exemptions or tax credits might be offered to encourage recycling, or reuse.

We will be looking at property and equipment tax. corporate income tax and sales, use and excise tax to see if changes can be made to make the tax structure more consistent with the State's priority on promotion of recycling.

Other recommendations of the task force are being evaluated for feasibility and implementation.

We are considering measures such as making technical expertise of the department of health available to small businesses for assistance in exploring reduction, recycling, and reuse.

We will also consider utilizing department staff to promote an active exchange between the waste program and Tennessee industries.

I would like to close by thanking you, Mr. Chairman, for this opportunity to explore what the State is doing and what can be done to promote reduction, recycling, recovery and reuse of hazardous waste by Tennessee industries.

I would also like to commend the Office of Technological Assessment for their valuable research in hazardous waste management and alternative strategies.

As I have noted, the State has indicated an interest in investigating what further action can be taken, and I look forward to your continuing interest and cooperation in working to insure a safe Tennessee for future generations.

Thank you very much.

[The prepared statement of Mr. Word follows:]

24-419 O—83——6

JAMES WORD'S TESTIMONY AT PUBLIC HEARING ON
ALTERNATIVES TO LAND DISPOSAL OF HAZARDOUS WASTES

JACKSON, TENNESSEE
MARCH 30, 1983

I AM JAMES WORD, DEPUTY COMMISSIONER AND ACTING COMMISSIONER OF THE TENNESSEE DEPARTMENT OF PUBLIC HEALTH. I HAVE RESPONSIBILITY FOR ADMINISTERING THE STATE'S REGULATORY PROGRAMS IN AIR POLLUTION, RADIOLOGICAL HEALTH, WATER MANAGEMENT, SURFACE MINE CONTROL, AND SOLID WASTE MANAGEMENT, WHICH INCLUDES HAZARDOUS WASTE MANAGEMENT. I AM ALSO CHAIRMAN OF THE GOVERNOR'S SAFE GROWTH CABINET COUNCIL, WHICH THE GOVERNOR ESTABLISHED TO ADVISE AND ASSIST HIM IN MANAGING PROBLEMS OF ENVIRONMENTAL CONCERN IN THE STATE.

ACCORDING TO THE BEST INFORMATION CURRENTLY AVAILABLE TO US, TENNESSEE INDUSTRY ANNUALLY PRODUCES APPROXIMATELY 711,000 TONS OF WASTE MATERIAL CLASSIFIED AS HAZARDOUS. APPROXIMATELY 23,000 TONS OF HAZARDOUS WASTE ARE TREATED IN TENNESSEE EACH YEAR AT THE EIGHT COMMERCIAL TREATMENT FACILITIES LOCATED IN THE STATE, WHILE ROUGHLY 48,000 TONS ARE SHIPPED OUT-OF-STATE BY TENNESSEE GENERATORS FOR TREATMENT OR DISPOSAL IN OTHER STATES. THE MAJORITY OF THE HAZARDOUS WASTES PRODUCED IN TENNESSEE ARE TREATED OR STORED ON THE SITE AT WHICH THEY ARE GENERATED.

THE DEPARTMENT IS CURRENTLY IN THE FINAL STAGES OF APPLYING FOR DELEGATION OF AUTHORITY FROM THE ENVIRONMENTAL PROTECTION AGENCY FOR ADMINISTRATION OF PHASE II A AND B UNDER SUBTITLE C OF THE RESOURCE CONSERVATION AND RECOVERY ACT. WHEN DELEGATION IS COMPLETE, THE DEPARTMENT WILL HAVE FULL AUTHORITY TO REGULATE STORAGE AND TREATMENT FACILITIES AND HAZARDOUS WASTE INCINERATORS IN TENNESSEE. WE HAVE RECENTLY BEGUN THE PROCESS OF APPLYING FOR DELEGATION OF AUTHORITY FOR PHASE II-C, WHICH APPLIES TO THE PERMITTING OF HAZARDOUS WASTE LANDFILLS.

THERE ARE SEVERAL COMPANIES IN TENNESSEE TODAY WHICH SUCCESSFULLY RECYCLE OR REUSE THEIR HAZARDOUS WASTES. THERE ARE MANY MORE WHICH PARTICIPATE IN WASTE EXCHANGES SUCH AS THE ONE ADMINISTERED BY THE TENNESSEE MANUFACTURER'S ASSOCIATION. THESE PROJECTS HELP TO REDUCE THE AMOUNT OF WASTE WHICH MUST ULTIMATELY BE DISPOSED.

TENNESSEE LAW CURRENTLY PROVIDES CERTAIN INCENTIVES FOR RECYCLING TO GENERATORS OF HAZARDOUS WASTE. THE RULES AND REGULATIONS PROMULGATED PURSUANT TO THE 1977 TENNESSEE HAZARDOUS WASTE MANAGEMENT ACT PROVIDE THAT A HAZARDOUS WASTE MAY BE EXEMPTED FROM MANAGEMENT REQUIREMENTS AND FROM FEES IF IT IS BEING BENEFICIALLY USED OR REUSED OR LEGITIMATELY RECYCLED OR RECLAIMED, OR IF IT IS BEING ACCUMULATED, STORED OR TREATED PRIOR TO RECYCLING OR RECOVERY. THE DEPARTMENT TO DATE HAS RECEIVED 23 PETITIONS FOR EXEMPTION UNDER THIS RULE. NINE PETITIONS HAVE BEEN APPROVED, ONE DENIED, AND THE REMAINDER ARE IN PROCESS. THE HAZARDOUS WASTE MANAGEMENT FEE WHICH IS ASSESSED ON GENERATION OF HAZARDOUS WASTES UNDER THIS ACT PROVIDES AN INCENTIVE IN ITSELF FOR GENERATORS TO REDUCE THE VOLUME OF HAZARDOUS WASTE THEY PRODUCE, OR TO RECYCLE IT COMPLETELY.

THE STATE OF TENNESSEE RECOGNIZES THAT IT HAS A RESPONSIBILITY TO FURTHER ENCOURAGE THE UTILIZATION OF ALTERNATIVES OTHER THAN LAND DISPOSAL OF HAZARDOUS WASTES. OVER A YEAR AGO GOVERNOR ALEXANDER CHARGED HIS SAFE GROWTH TEAM TO MAKE RECOMMENDATIONS TO HIM FOR STATE ACTION IN THREE AREAS OF HAZARDOUS WASTE MANAGEMENT: THE CLEAN-UP OF ABANDONED HAZARDOUS WASTE DUMP SITES, THE PROCEDURES FOR LOCATING A LEGAL AND SAFE HAZARDOUS WASTE DISPOSAL FACILITY IN THE STATE, AND WAYS IN WHICH THE STATE CAN ENCOURAGE RECYCLING AND OTHER ALTERNATIVES TO THE LAND DISPOSAL OF HAZARDOUS WASTE. THE SAFE

GROWTH HAZARDOUS WASTE TASK FORCE WHICH WAS ESTABLISHED TO ADDRESS THESE ISSUES, INCLUDED REPRESENTATIVES OF INDUSTRY, ENVIRONMENTAL GROUPS, AND STATE GOVERNMENT, AND WAS CHAIRED BY MR. FRANK BUMSTEAD, THE CITIZEN CHAIRMAN OF THE SAFE GROWTH TEAM. THE TASK FORCE PRESENTED ITS RECOMMENDATIONS TO GOVERNOR ALEXANDER AND TO THE TEAM ON NOVEMBER 22, 1982. THE SECTION OF THE REPORT DEALING WITH RECYCLING READS, IN PART, "THE RECYCLNG COMMITTEE OPERATED FROM THE PREMISE THAT LAND DISPOSAL OF HAZARDOUS WASTES IS THE LEAST DESIRABLE LEGAL DISPOSAL ALTERNATIVE FROM THE STANDPOINTS OF ENVIRONMENTAL INTEGRITY AND PUBLIC HEALTH. THE COMMITTEE ATTEMPTED TO IDENTIFY WAYS TO CREATE INCENTIVES FOR GENERATORS OF HAZARDOUS WASTE TO (A) REDUCE THE AMOUNT OF HAZARDOUS WASTE GENERATED, BY CHANGE IN THE PRODUCTION PROCESS OR PRODUCT; (B) RECOVER REUSABLE COMPONENTS OF THE WASTE STREAM FOR RECYCLING OR REUSE; (C) RENDER WASTE MATERIALS NON-HAZARDOUS BY PHYSICAL, CHEMICAL, OR BIOLOGICAL TREATMENT; (D) DESTROY HAZARDOUS WASTES THROUGH HIGH TEMPERATURE INCINERATION; OR (E) SOLIDIFY OR STABILIZE RESIDUALS PRIOR TO LANDFILLING." THE REPORT GOES ON TO LIST NINE SPECIFIC RECOMMENDATIONS.

MANY OF THE RECOMMENDATIONS OF THE SAFE GROWTH TASK FORCE ARE ALREADY BEING IMPLEMENTED BY GOVERNOR ALEXANDER'S ADMINISTRATION. WE ARE WORKING VERY CLOSELY WITH THE JOINT LEGISLATIVE STUDY COMMITTEE CHAIRED BY REPRESENTATIVE RAY JOHNSON ON THE LEGISLATION NOW PENDING BEFORE THE GENERAL ASSEMBLY, WHICH PROVIDES FOR THE PROCEDURE FOR ESTABLISHING A HAZARDOUS WASTE DISPOSAL FACILITY, AND FOR THE CLEAN-UP OF ABANDONED DUMP SITES. THERE ARE A NUMBER OF PLACES IN THE BILL AS IT IS NOW DRAFTED WHICH ENCOURAGE ALTERNATIVES TO LANDFILLING AS A METHOD OF DISPOSAL. (A) THE BILL STATES THAT IT IS

THE POLICY OF THE STATE OF TENNESSEE TO "EMPHASIZE ALTERNATIVES TO LAND DISPOSAL OF HAZARDOUS WASTES, AS IS PRACTICABLE." (B) THE FEES WHICH WILL BE USED TO ESTABLISH AND MAINTAIN THE REMEDIAL ACTION FUND ARE ASSESSED ON GENERATION OF HAZARDOUS WASTES, THEREBY ENCOURAGING SOURCE REDUCTION. (C) HAZARDOUS WASTES WHICH ARE "BENEFICIALLY USED OR REUSED OR LEGITIMATELY RECYCLED OR RECLAIMED" ARE EXEMPT FROM THE FEE ASSESSMENT.

(D) THE BILL ALSO PROVIDES FOR THE ESTABLISHMENT OF A RESPONSIBLE WASTE DISPOSAL INCENTIVE FUND, TO BE AWARDED TO THE FIRST LOCAL GOVERNMENT WHICH AGREES TO ACCEPT A COMMERCIAL DISPOSAL FACILITY MEETING CERTAIN REQUIREMENTS WITHIN ITS JURISDICTION. IN ORDER TO BE ELIGIBLE TO RECEIVE THE AWARD, THE FACILITY MUST BE MULTI-PURPOSE WITH CAPABILITY FOR ADVANCED TECHNOLOGY, HIGH-TEMPERATURE THERMAL TREATMENT AS WELL AS LANDFILL. (E) THE HOST COMMUNITY IS ALSO EMPOWERED TO LEVY AN ADDITIONAL FEE ON WASTES DISPOSED AT THE FACILITY; THE STATED MAXIMUM AMOUNT FOR FEES ON LAND DISPOSAL OF WASTES IS DOUBLE THAT ALLOWED ON TREATMENT OF WASTES. (F) FINALLY, THE BILL DIRECTS THAT A STATE HAZARDOUS WASTE MANAGEMENT FEE LEVIED ON THE COMMERCIAL FACILITY "SHALL BE STRUCTURED TO ENCOURAGE THE TREATMENT, REDUCTION, AND RECLAMATION OF HAZARDOUS WASTES."

AN ADDITIONAL RECOMMENDATION OF THE HAZARDOUS WASTE SAFE GROWTH TASK FORCE IS CURRENTLY BEING PROPOSED TO THE GENERAL ASSEMBLY IN THE FORM OF AN AMENDMENT TO THE HAZARDOUS WASTE MANAGEMENT ACT. THIS AMENDMENT, IF PASSED, WILL DIRECT THE SOLID WASTE DISPOSAL CONTROL BOARD TO "PROMULGATE RULES AND REGULATIONS TO RESTRICT OR PROHIBIT THE BURIAL OF HAZARDOUS WASTES IF: (1) THE WASTE BECAUSE OF ITS HIGH TOXICITY, TENDENCY TO LEACH OR MIGRATE, OR OTHER CHARACTERISTIC

REPRESENTS AN UNUSUALLY HIGH DANGER TO THE PUBLIC HEALTH, SAFETY OR ENVIRONMENT; AND (2) AN ALTERNATIVE TO LAND DISPOSAL WHICH IS BOTH TECHNOLOGICALLY AND ECONOMICALLY FEASIBLE EXISTS."

THE SAFE GROWTH CABINET HAS ALSO COMMITTED FUNDS TO UNDERTAKE A STUDY OF THE TENNESSEE TAX LAWS TO EXPLORE WAYS IN WHICH POSSIBLE REDUCTIONS, EXEMPTIONS, OR TAX CREDITS MIGHT BE OFFERED TO ENCOURAGE RECYCLING OF HAZARDOUS WASTE. WE'LL BE LOOKING AT PROPERTY AND EQUIPMENT TAX, CORPORATE INCOME TAX, AND SALES, USE AND EXCISE TAX TO SEE IF CHANGES CAN BE MADE TO MAKE THE TAX STRUCTURE MORE CONSISTENT WITH THE STATE'S PRIORITY ON THE PROMOTION OF RECYCLING.

OTHER RECOMMENDATIONS OF THE SAFE GROWTH TASK FORCE ARE BEING EVALUATED FOR FEASIBILITY OF IMPLEMENTATION. WE ARE CONSIDERING MEASURES SUCH AS MAKING TECHNICAL EXPERTISE ON THE DEPARTMENT OF PUBLIC HEALTH STAFF AVAILABLE TO SMALL BUSINESSES FOR ASSISTANCE IN EXPLORING OPPORTUNITIES FOR REDUCTION, RECYCLING AND REUSE. WE WILL ALSO CONSIDER UTILIZING DEPARTMENT STAFF TO FURTHER PROMOTE AN ACTIVE EXCHANGE OF WASTES BY TENNESSEE INDUSTRIES, BY MATCHING UP INDUSTRIES PRODUCING CERTAIN HAZARDOUS WASTES WITH THOSE WHO CAN USE THOSE WASTES AS A RAW MATERIAL. WE WILL EXPLORE OTHER WAYS TO MAKE AVAILABLE INFORMATION ON ALTERNATIVE TECHNOLOGIES AND PROCESSES, SUCH AS BY CONFERENCE, BY TRAVELING DEMONSTRATIONAL MODULE, PUBLICATIONS, OR OTHER MEANS.

I WOULD LIKE TO THANK CONGRESSMAN GORE FOR THIS OPPORTUNITY TO EXPLORE WHAT THE STATE IS DOING AND WHAT CAN BE DONE TO PROMOTE THE REDUCTION, RECYCLING, RECOVERY AND REUSE OF HAZARDOUS WASTES BY TENNESSEE INDUSTRIES. I WOULD ALSO LIKE TO COMMEND THE OFFICE OF TECHNOLOGY ASSESSMENT FOR THEIR VALUABLE RESEARCH IN HAZARDOUS WASTE MANAGEMENT AND ALTERNATIVE STRATEGIES. AS I HAVE NOTED, THE STATE HAS ALREADY INDICATED ITS INTEREST IN INVESTIGATING WHAT FURTHER ACTION CAN BE TAKEN IN THIS IMPORTANT AREA. I LOOK FORWARD TO YOUR COOPERATION IN WORKING TO ENSURE A SAFE TENNESSEE FOR FUTURE GENERATIONS.

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Mr. GORE. Thank you very much, Dr. Bruner.

We will hold off on questions until the panel has completed its testimony.

Next we will hear from Penny Harrington, an attorney with the Environmental Action Fund in Nashville.

Welcome, Ms. Harrington.

Ms. HARRINGTON. Thank you very much. Mr. Chairman, members of the subcommittee, I appreciate very much being asked to testify here today on behalf of the Environmental Action Fund of Tennessee.

The fund is a coalition of several groups across the State concerned about the environment. The board of directors decided the focus of the fund's activities in 1983 would be on the cleanup of old abandoned hazardous waste sites in Tennessee.

We quickly discovered that the issue of the cleanup of the old sites cannot be totally separated from the possibility of the creation of new ones.

I understand the topic before us today on which you would like a Tennessee environmentalist's perspective is the creation of hazardous waste sites by landfills.

The first question on which you asked comment was the desirability of alternatives to landfilling. Our position is that almost any alternative is preferable to the landfilling of hazardous waste.

We do, of course, recognize that total elimination of landfilling is not practicable at the present state of technology. However, Tennessee environmentalists strongly support the use of alternatives such as recycling, reduction, resource reclamation and incineration.

We believe that all of these alternatives should be implemented to their fullest extent prior to the use of landfilling.

We look forward to the presentation here today of information concerning the alternatives which are increasingly available to industries.

Tennesseans have never been afraid of new technology. Although many of us have liked to think of our State as one in which the economy is well balanced between industry and agriculture, we recognize that industrial growth is a primary need if Tennesseans are to attain a higher economic standing in this country.

Tennesseans welcomed the establishment of the Oak Ridge National Laboratories.

Legislation is currently pending in the Tennessee Legislature to establish a technology corner in east Tennessee that would be an Eastern version of the Silicone Valley. We have not feared the past and we do not fear the future.

But Tennessee is the ninth largest producer of hazardous waste in the Nation. In the southeast region Tennessee industry produces the greatest amount of hazardous wastes.

These statistics cause Tennessee environmentalists some concern because we have not, so far, applied the advanced technologies which have been developed for the treatment of hazardous waste.

We believe the receptivity of Tennesseans to new technology makes our State a likely place to implement these alternatives as the chairman spoke about in his own district a few moments ago.

There is also legislation currently pending in the Tennessee General Assembly which would establish a method for the siting of a commercial landfill which Dr. Bruner referred to.

The legislation also provides a small fund for the cleanup of abandoned hazardous waste sites and for methods of forcing the responsible industries to clean up the dump sites they have created.

We support that legislation in its present form. We feel that the joint hazardous waste study worked hard and honestly received information from all sides of this question in an effort to draft a bill which reflects the concerns of all Tennesseans.

The committee members, and especially Chairman Ray Johnson, attempted to balance the problems which industry claimed they have, problems which they claim will develop even more if Tennessee imposes user fees which will drive industry and jobs from our State.

They also listen to the environmentalists' pleas for the need to protect in the future and to clean up the sins of our fathers in the old waste sites.

At the present time there is no commercial facility in Tennessee for the disposal of hazardous waste. Most of the hazardous waste generated in Tennessee is disposed of onsite. Other waste is shipped to Alabama or South Carolina for disposal in a commercial facility or it used to go to Alabama anyway.

While Tennessee environmentalists have not taken the position that all siting of landfills must stop, we are concerned about sufficient control of the location of the facility and the methods of operation and monitoring of a facility should it ever be sited.

The major factor to be considered in the use of alternatives to landfilling in the State of Tennessee is that which I would imagine to be the same as other States in this Nation, economic incentives.

In the nations of Western Europe and Japan where there is a central government plan it is possible to arrange the economy to force industry to use modern technology to dispose of their waste.

In the U.S. system of government the main tool for achieving the goal of decreased use of landfills is through economic incentives, primarily the use of taxation.

At one level of taxation on the generation of hazardous waste it is possible for industry to shift the increased cost to the consumers.

While the fees recovered can be used for monitoring of ongoing programs and cleanup of abandoned sites, that level of taxation does not encourage industry to reduce generation or to recycle and reduce.

It would appear to be necessary that the fees be set high enough to cut into a company's profit margin and thus make the use of new technologies more profitable than the old ways. That is the way a capitalistic system uses to achieve social planning.

The fee schedules which are in the proposed State legislation do not begin to reach the second level of incentives, nor do I believe that it would be wise to suggest to the Tennessee General Assembly at this point that they should consider that alternative, because other States have not considered the need for economic incentives against landfilling and thus the prospect of Tennessee industry abandoning the State for other States which have less harsh tax penalties for the generation of hazardous waste is a quite real one.

As responsible environmentalists, we recognize the need for a balance between the need for industry to produce and make a profit against the need to preserve the quality of our environment.

There does not seem to be at the State level the kind of expertise that is needed to develop State criteria for landfilling which can use the sophisticated techniques of separation of hazardous waste that is less harmful in a landfill from that which, as the chairman so aptly put it recently, eats like Drano through the bottom of the fill site itself.

I do have some information which the department of public health collected 2 years ago on some impounded sites in Tennessee, both legal and illegal, which gives some indication of the problem of landfilling in Tennessee.

Seventy-two percent of all the impoundments were over fractured or cavernous limestone or sand. Only 18 of the 226 assessed impoundments had liners; 29 percent of the industrial impoundments contained wastes which were clearly hazardous and 100 percent of the impoundments belonging to the chemical and allied products industry contained potentially hazardous waste.

Eighty-four percent of all assessed impoundments in all categories had a potential to contaminate ground water.

These statistics indicate some of the reasons for the outcry of Tennessee citizens whenever a site is proposed to be established near their homes. It was a result of the active work of the citizens of Henderson County in the early part of this year that led to a great strengthening of the house bill 945 in the Tennessee General Assembly.

Much of the focus of the bill, in addition to the cleanup of the hazardous dumps, is on the location of landfill under certain conditions.

A county would have to ask for and would receive an incentive of a possible total of $2 million for agreeing to accept such a site.

The county would also be allowed to impose local fees. One of the strongest sections of the bill requires public hearings, toll-free telephone numbers and other methods of public information including approval by the county government as has been agreed to recently.

There is also a severe penalty section that should be an incentive to any industry to abide by the letter of the law.

An amendment to the bill by Chairman Johnson is one that is strongly supported by the Environmental Action Fund earmarking 25 percent of the $2 million incentive fund for tests monitoring the health risks in the area.

We are also strongly supportive of the provision providing for public hearings and for information concerning background of any company or employee of a company which proposes to locate a site.

The EAF is encouraging the general assembly to make house bill 945 a stronger bill with a broader definition of hazardous waste and generator fees set upon the amount of production.

We believe it would result in moving toward the incentive to alternatives without being punitive to industry. However, we recognize that none of this legislation can be a guard against the fact of chemical contamination that could result from a landfill in which all chemicals are poured haphazardly, creating a witches' brew, the effects of which no chemist or medical doctor can today predict.

No geologist can predict with any degree of certainty the effect on surrounding ground waters, surface water, or even the giant aquifers which supply so much of our population with their drinking water.

It is a matter of public record that the geologists were wrong for many years in their assessment of hydraulic flow around Velsicol site near Toone, Tenn.

Thus, in spite of the fact that we presently support house bill 945, as amended, we are concerned about the state of the laws of Tennessee.

It is difficult for States to have the kind of expertise that is needed. Indeed, from my reading in this area it would seem to me that it is difficult for even the most sophisticated departments of the Government or environmental divisions of major corporations to actually know the far-reaching impact of their method of disposing of their hazardous waste.

Thus the Environmental Action Fund would encourage the creation of Federal standards to help guide the States and indeed to advise industries which dispose of hazardous waste on the safety of their activities.

We would also support an effort to encourage any possible method of reduction in the generation of hazardous waste.

Tennessee environmentalists are frustrated. In the past few months we have seen that frustration shared by Tennessee lawmakers and by the frightened members of the public who banded together and backed down one of the largest corporations in this country. Its frustration is born out of a lack of knowledge and an inability to write State laws that will both protect our people and keep our industries in Tennessee.

As long as there are States who are willing to enact laws controlling the generation of disposal of hazardous waste which do not protect their people and their environment, there is a constant threat to the lawmakers and executives of other States that industry, looking at the ever-loving bottom line, will have no choice but to abandon the State with the standards and go to those with the lower ones.

If we were able to develop, in Tennessee, a strong State program using tax incentivies that actually encourage reduction, recycling, and incineration, these incentives for the protection of the environment would be seen by industry as disincentives to the production of goods profitably. They tell us they would leave.

Many legislators and other officials believe them. Therefore we need national legislation to encourage alternatives to cheap landfilling .

Thank you, members of the subcommittee.

[The prepared statement of Ms. Harrington follows:]

TESTIMONY OF PENNY HARRINGTON, ENVIRONMENTAL ACTION FUND, BEFORE THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT COMMITTEE ON SCIENCE AND TECHNOLOGY

Mr. Chairman and members of the subcommittee, I appreciate very much being asked to testify today on behalf of the Environmental Action Fund of Tennessee. The Fund is a coalition of several groups across the State of Tennessee concerned about the environment. The Board of Directors has decided the focus of the Fund's activities in 1983 would be on the clean-up of old abandoned hazardous waste sites

in Tennessee. We quickly discovered that the issue of the clean-up of the old sites cannot be totally separated from the possibility of the creation of new ones. I understand the topic before us today on which you would like a Tennessee environmentalist's perspective is the creation of hazardous waste sites by landfills.

The first question on which you asked for comment was the desirability of alternatives to land-filling of hazardous waste for their disposal. Our position is that almost any alternative is preferable to land-filling of hazardous waste. We do, of course, recognize that a total elimination of land-filling is not practicable at the present state of technology. However, Tennessee environmentalists strongly support the use of alternatives such as recycling, reduction, resource reclamation and incineration. We believe that all of these alternatives should be implemented to their fullest extent prior to the use of land-filling.

We look forward to the presentation here today of information concerning the alternatives which are increasingly available to industries.

Tennesseans have never been afraid of new technology. Although many of us have liked to think of our state as one in which the economy is well-balanced between industry and agriculture, we recognize that industrial growth is a primary need if Tennesseans are to attain a higher economic standing in this country. Tennesseans welcomed the establishment of the Oak Ridge nuclear laboratories. Legislation is currently pending in the Tennessee Legislature to establish a technology corner in East Tennessee that would be an Eastern version of the Silicone Valley. We have not feared the past, and we do not fear the future.

Tennessee is the ninth largest producer of hazardous waste in the nation. In the southeast region Tennessee industry produces the greatest amount of hazardous waste than any other state. These statistics cause Tennessee environmentalists some concern because we have not so far applied the advanced technologies which have been developed for treatment of hazardous waste to our own generating industries. We believe the receptivity of Tennesseans to new technology makes our state a likely place to implement these alternatives.

There is also legislation currently pending in the Tennessee General Assembly which would establish a method for the siting of a commercial landfill in Tennessee. That legislation would also provide for a small fund for the clean-up of abandoned hazardous waste sites and for methods of forcing the responsible industries to clean up the dump sites that they have created. We support that legislation at present. We feel that the Joint Hazardous Waste Study Committee of the Tennessee General Assembly worked hard and honestly received information from all sides of this question in an effort to draft a bill which reflects the concerns of all Tennesseans. The committee members, and especially Chairman Johnson, attempted to balance the problems which industry claimed that they have. Problems which they claim will develop if Tennessee imposes user fees which will drive industry and jobs from our state. They also listened to the environmentalists' pleas for the need to protect the environment in the future and to clean up the sins of our fathers in the old hazardous waste dumps.

At the present time there is no commercial facility in Tennessee for the disposal of hazardous waste. Most of the hazardous waste generated in Tennessee is disposed of on-site. Other waste is shipped to Alabama or to South Carolina for disposal in a commercial facility. While Tennessee environmentalists have not taken a position that all siting of landfills must stop, we are concerned about the sufficient control over the location of a facility and the methods of operation and monitoring of a facility should it ever be sited.

The major factor to be considered in the use of alternatives to land-filling in the State of Tennessee is that which I would imagine to be the same in other states in this nation . . . economic incentives. In the nations of Western Europe and Japan where there is central government planning, it is possible to arrange the economy to force industry to use modern technology to dispose of their waste. In the United States' system of government the main tool for achieving the goal of decreased use of landfills is through economic incentives, primarily the use to taxation. At one level of taxation on the generation of hazardous waste it is possible for industry to shift the increased cost to the consumers. While the fees recovered can be used for monitoring of ongoing programs and clean-up of abandoned sites, that level of taxation does not encourage industry to reduce generation or to recycle and reduce. It would appear to be necessary that the fees be set high enough to cut into a company's profit margin and thus make the use of new technologies more profitable than the old ways. That is the way a capitalistic system uses to achieve social planning. The fee schedules which are in the proposed state legislation do not begin to reach the second level of incentive, nor do I believe that it would be wise to suggest to the Tennessee General Assembly at this point that they should consider that alternative

because other states have not considered the need for economic incentives against land-filling and thus the prospect of Tennessee industry abandoning the state for other states which have less harsh tax penalities for the generation of hazardous waste is a quite real one.

As responsible environmentalists, we recognize the need for a balance between the need for industry to produce and make a profit against the need to preserve the quality of our environment.

There does not seem to be at the state level the kind of experitise that is needed to develop state criteria for land-filling which can use the sophisticated techniques of separation of hazardous waste that is less harmful in a landfill from that which, as the Chairman so aptly put it recently, eats like Drano through the bottom of the fill site itself. I do have some information which the Department of Public Health collected two years ago on some impoundment sites in Tennessee, both legal and illegal, which give some indication of the problem of land-filling in Tennessee. Seventy-two percent of all the impoundments were over fractured or cavernous limestone or sand. Only 18 of 226 assessed impoundments had liners. Twenty-nine percent of the industrial impoundments contained wastes which were clearly hazardous and a hundred percent of the impoundments belonging to the chemical and allied products industry contained potentially hazardous waste. Eighty-four percent of all assessed impoundments in all categories had a potential to contaminate ground water. These statistics indicate some of the reasons for the outcry of Tennessee citizens whenever a site is proposed to be established near their homes. It was a result of the active work of the citizens of Henderson County in the early part of this year that led to a great stengthening of House Bill 945 in the Tennessee General Assembly. Much of the focus of the bill, in addition to the clean-up of the old hazardous dumps is on the location of a landfill under certain conditions. A county would have to ask for it and would receive an incentive of a possible total of $2 million dollars for agreeing to accept such a site. The county would also be allowed to impose local fees. One of the strongest sections of the bill requires public hearings, toll-free telephone numbers and other methods of public information. There is also a severe penalty section which should be an incentive to abide by the letter of the law. An amendment to the bill by Chairman Johnson is one that is strongly supported by the Environmental Action Fund in earmarking 25 percent of the $2 million dollar incentive fund for tests monitoring the health risks in the area. We are also strongly supportive of the provision providing for public hearings and for information concerning the background of any company or employee of a company which proposes to locate a site.

The EAF is encouraging the General Assembly to make HB waste and generator fees set upon amount of production. We believe it would result in moving toward the incentive to alternatives without being punitive to industry.

However, we recognize that none of this legislation can be a guard against the fact of chemical contamination that could result from a landfill into which all chemicals are poured haphazardly, creating a witches' brew, the effects of which no chemist or medical doctor can today predict. No geologist can predict with any degree of certainty the effect on surrounding ground water, surface water, or even the giant aquifers which supply so much of our population with their drinking water. It is a matter of public record that the geologists were wrong for many years in their assessment of the hydraulic flow around the Velsicol site near Toone, Tennessee. Thus, in spite of the fact that we presently support House Bill 945, as amended, we are concerned about the State of the law in Tennessee. It is difficult for states to have the kind of expertise that is needed in this area. Indeed, from my reading in this area, it would seem to me that it is difficult for even the most sophisticated departments of the federal government or environmental divisions of major corporations to actually know the far-reaching impact of their method of disposing of their hazardous waste. Thus, the Environmental Action Fund would encourage the creation of federal standards to help guide the states, and indeed to advise industries which dispose of hazardous waste, on the safety of their activities. We would also support an effort to encourage any possible method of reduction in the generation of hazardous waste.

Tennessee environmentalists are frustrated. In the past few months we have seen that frustration shared by Tennessee lawmakers and by the frightened members of the public who banded together and backed down one of the largest corporations in this country. It's frustration borne out of a lack of knowledge and an inability to write state laws that will both protect our people and keep our industries in Tennessee. As long as there are states who are willing to enact laws controlling the generation and disposal of hazardous waste which do not protect their people and their environment, there is a constant threat to the lawmakers and executives of other

states that industry, looking at the ever-loving bottom line, will have no choice but to abandon the state with the higher standards and go to those with the lower ones.

If we are able to develop in Tennessee a strong state program using tax incentives to encourage reduction, recycling and incineration, those incentives for the protection of our environment would be seen by industry as disincentives to the production of goods. They tell us they would leave. Many legislators and other officials believe them. Therefore, we need national legislation to encourage alternatives to cheap land-filling.

Mr. GORE. Thank you very much. I appreciate the testimony.

And the final member of this panel is Bobby Dyer, county executive of Henderson County, whose office is located in Lexington, Tenn. And, as I have said before, it is a great pleasure to have you here and we look forward to your statement.

Mr. DYER. Thank you.

I would like to thank the subcommittee for the invitation to testify today on the subject of hazardous waste.

I must say that I was impressed when I picked up the newspaper Sunday and saw my name listed under the list of experts that would testify in this subcommittee hearing. I feel that in all honesty I must qualify myself from the very beginning.

I am not a chemist. I am not a doctor. I am not a chemical engineer. My background is principally in accounting and business administration.

I would like to talk to you today and try to relate to you the emotional effects that a proposed hazardous waste dump site in our commnunity had on the lives of 21,390 of its residents and to explain to you why the people became so emotionally upset.

Up until December 1982 most Henderson Countians were like myself and had very little knowledge of what hazardous waste really was. We were not aware that a Houston-based company had spent more than a year quietly searching for a site and securing land options on 1,455 acres of land in Henderson County for the purpose of placing a hazardous waste dump site in our area.

On December 23, 1982, the well-kept secret was announced as a hazardous waste dump site in the northwest section of our county.

Emotions did run very high in Henderson County. You could see the fear in people's eyes, not only the area close to the dump site but all across Henderson County as well as surrounding counties.

Officials from the disposal company complained that local officials did not, and I quote: "Take the time to evaluate the proposed project," unquote.

Well, it didn't take much time for Henderson Countians to realize that we were going to be subjected to the devaluation of our real estate to the point that it would have more than diminished any royalties paid by the disposal company as an incentive for our county to accept this hazardous waste dump.

To support this claim we had one farm approximately 1½ miles from the proposed site that already had a sales contract signed and earnest money deposited when the buyer, who was not a Henderson Countian, but an executive in Memphis, Shelby County, Tenn., and former resident of the State of Kansas, heard about the proposed dump plans and declined to make the purchase, thus forfeiting his earnest money.

He told me later that he received many calls from land owners in Henderson County where he had looked prior to signing the

sales contract and in each case the landowners were calling to tell him that they would take less money for their land than they had previously offered.

We also realized that 850, 20-ton truckloads of hazardous waste would be coming into our county every 30 days in order for the disposal company to reach their volume of waste projections of 17,000 tons per month.

The initial cost to securing adequate firefighting equipment and equipment to handle potential hazardous waste spills in our county would have exceeded $300,000 the first year.

We were told that although the dump site would only consume 200 to 300 acres, that the additional 1,200 acres secured by the company would be used for industrial development as industry would be locating in our county, because it would be close to a hazardous waste dump site.

Contrary to this report, we were told by representatives of our local industry that if they did not already have plans in Henderson County that they would not locate there because of the fear of exposure to their personnel of the potential dangers that are involved in living in an area near a hazardous waste dump. The people of Henderson County wondered who they could believe.

One industry notified us that they planned to move to the State of Texas if in fact the company continued their plans to locate a dump site in Henderson County.

This industry alone employed approximately the same amount of people that the waste disposal company had planned to employ.

Company officials in making their announcement of the selection of Henderson County stated that the proposed site was selected by a team of consulting engineers and geologists after exhaustive studies of geological formations throughout the State, and after investigating and testing other areas the company purchased the land options.

It is, in fact, a solution to the overall problem of hazardous waste, stated a divisional vice-president of the company. He further stated that in his judgment it was the best site in the State of Tennessee.

On December 23, 1982, company officials also told the people of Henderson County that this was the safest technology available for the construction of a hazardous waste landfill in the Nation today.

Yet on January 20, 1983, less than 1 month later, Mr. Doug McCurry, Chief of the EPA's Waste Management Division in the Atlanta Regional Office, said EPA had changed its approach on regulations.

The approach in the new regulations is really a turnabout, Mr. McCurry said. The reliance is now on the design and construction of the facility and not on the site characteristics, emphasizing that with adequate construction it could be located in any part of the State of Tennessee. And if this company had pursued its plans to apply for a Federal permit to construct a landfill near Lexington, Tenn., the permit would have been denied because the proposal would not have met Federal regulations.

Again, who could the people of Henderson County really believe?

We want the industrial growth and progress in our county, but we want clean growth.

The fault of this nationwide dilemma lies not entirely with the manufacturers but with the lawmakers as well, those who have not done their part to encourage the development of alternatives to waste dumping.

The public officials in Washington, Nashville, and especially in Henderson County can always tell you what is wrong as it relates to government, but what we are going to have to do is realize in the future that we must do more than identify the problem. We must find solutions.

Industry today are developing computerized machinery so quickly that it is difficult for the citizens of our country to keep up with the training in basic skills to operate these machines. Government is working with industry in the State of Tennessee to see that Tennesseans are trained in basic skills to provide them more and better jobs.

I support this type of joint effort and I encourage it. But I think we need to look at our priorities. Should government not be spending millions of dollars in cooperation with industry to further develop and encourage the use of technology to recycle or incinerate hazardous waste instead of offering millions of dollars to persuade counties to accept the dump site that in a few short years will cost millions of additional dollars to clean up?

We are not disposing of our hazardous waste today. We are only temporarily storing it for some future generations. It is simply a band-aid approach to a very serious problem.

I realize that economics is very important to industry but there is nothing more important than the health, welfare and safety of the human race.

The same Government that enacted rules and regulations through OSHA, through the warnings of hazards of smoking, the requirements of seatbelts and restraining devices in cars to protect our children, is the same Government that is encouraging the development of hazardous waste dumps which have not been proven safe and are potentially endangering the lives of millions of Americans today.

Yes, the people of Henderson County did become emotionally disturbed and I hope today you will understand why. As the people of our country were given conflicting stories, they did not know who to turn to for help.

The Government officials that we were looking to for protection were the same Government officials who were promoting the disposal of hazardous waste by dumping.

It is our contention that unless a solution is found and unless the leaders of this Nation come to grips with the problem of hazardous waste that this emotional disturbance is not going to be limited to the people of Henderson County; it will stretch across this entire Nation.

Thank you very much.

[The prepared statement of Mr. Dyer follows:]

Prepared Statement of Bobby W. Dyer

I would like to thank the subcommittee for the invitation to testify today on the subject of hazardous waste.

My name is Bobby W. Dyer, county executive of Henderson County. I live at 58 Britt Street, Lexington, Tennessee.

I must say that I was impressed when I picked up the newspaper Sunday and saw that my name had been included in the list of experts that had been invited to testify before this subcommittee. I feel that in all honesty, I must qualify myself from the very beginning. I am not an expert on hazardous waste. I am not a chemist. I am not a chemical engineer. I am not a doctor. My background is principally in accounting and business administration, but I am here today to try to relate to you, the emotional effects that a proposed hazardous waste dump site in our community had on the lives of 21,390 of its residents and to explain to you why these people became so emotionally disturbed.

Up until December, 1982, most Henderson Countians were like myself and had very little knowledge of what hazardous waste really was. We were not aware that a Houston based company had spent more than a year quietly searching for a site and securing land options on 1,455 acres of land in Henderson County for the purpose of constructing a hazardous waste landfill. On December 23, 1982, the well kept secret was announced as a hazardous waste disposal company revealed it's plans for locating a hazardous waste dump site in the northwest sections of our county. Emotions did run very high. You could see the fear in the people's eyes, not only in the area that was near the proposed dump site, but all across Henderson and surrounding counties. Officials for the disposal company complained that local officials did not and I quote, "take the the time to evaluate the proposed project," unquote. Well, it didn't take much time however, for us to realize that Henderson County would be subjected to a devaluation of its real estate to the point that it would have more than diminished any royalties paid by the disposal company as an incentive for our county to accept this hazardous waste dump.

To support this claim, we had one farm approximately 1½ miles from the proposed site that had already had a sales contract signed and earnest money deposited when the buyer, who was not a Henderson Countian, but an executive in Memphis, Shelby County, Tennessee and a former resident of the State of Kansas, heard about the proposed dump plans and declined to make said purchase thus forfeiting his earnest money. He further stated that he had received many calls from landowners in Henderson County where he had looked prior to signing the sales contract and in each case the landowners were calling to tell him that they would take less money for their land than they had previously offered.

We also realized that 850 20-ton truckloads of hazardous waste would be coming into our country every 30 days in order for the disposal company to reach their volume waste projection of 17,000 tons per month.

The initial cost to secure adequate fire fighting equipment and equipment to handle a potential hazardous waste spill in our county would have exceeded $300,000.00 the first year. We were told that although the dump site area would only consume some 200 to 300 acres, that the additional 1,200 acres secured by the company would be used for industrial development as industry would be locating in our county, in order to be near the hazardous waste dump. Contrary to this report, we were told by representatives of our local industries that if they did not already have plants in Henderson County that they would not locate there because of their fear of the exposure to their personnel of the potential dangers that are involved in living in an area with a hazardous waste dump. The people of Henderson County wondered who can we believe.

One industry notified us that they planned to move to the State of Texas if, in fact, the company continued their plans to locate a dump site in Henderson County. This industry alone employed approximately the same number of people that the waste disposal company had planned to employ. Company officials in making their announcement of the selection of Henderson County, stated that the proposed site was selected by a team of consulting engineers and geologists after exhaustive studies of geological formations throughout the State and after investigating and testing other areas, the company purchased the land options. It is, in fact, a solution to the overall problem of Hazardous waste, stated a divisional vice-president of the company. He further stated that in his judgment this is the best site in the State of Tennessee.

On December 23, 1982, company officials also told the people of Henderson County that this was the safest technology available for the construction of a hazardous waste landfill in the Nation today. Yet, on January 20, 1983, less than one month later, Mr. Doug McCurry, chief of the Environmental Protection Agency's waste management division in the Atlanta Regional Office said, EPA has changed it's approach on regulations. The approach in the new regulations is really a turnabout, Mr. Curry said. The reliance is now on the design and construction of the facility

and not on the site characteristics. Emphazing that it could be located in any part of the State of Tennessee and that if the company had pursued it's plans to apply for a Federal permit to construct a landfill near Lexington, Tenn., the permit would have been denied because the proposal would not have met frederal regulations. Again, who could the people of Henderson County really believe.

We want industrial growth and progress in our county, but we want clean growth.

The fault of this nationwide dilemma lies not entirely with the manufacturers, but with the lawmakers, as well. Those who have not done their part to encourage the development of alternatives to waste dumping. The public officials in Washington, Nashville, and especially in Henderson County can always tell us what is wrong as it relates to government, but what we are going to have to realize is that in the future, we must do more than just identify the problems, we must find a solution.

Industries today, are developiong computerized machinery so quickly that it is difficult for the citizens of our country to keep up with training in basic skills to operate these machines. Government is working with industry in the State of Tennessee to see that Tennesseans are trained in the basic skills to provide them with more and better jobs. I believe this type of joint effort is good and I support it, but I think we need to look at our priorities. Should government not be spending millions of dollars also in cooperation with industry to further develop and encourage the use of technology to recycle or incinerate hazardous waste instead of offering millions of dollars to persuade counties to accept a dump site and in a few short year, spend millions of additional dollars to clean up the same dumps. We are not disposing of our hazardous waste today, we are only temporarily storing it for future generations. It's simply a band-aid approach to a very serious problem. I realize that economics is very important to industry, but there is nothing more important than the health, welfare, and safety of the human race. The same government that has enacted rules and regulations through OSHA, through the warnings of the hazards of smoking, the requirements of seatbelts and restraining devices in cars to protect our children, is the same government that is encouraging development of hazardous waste dumps which have not been proven safe and that are potentially endangering the safety and lives of millions of Americans, today.

Yes, the people of Henderson County did become emotionally disturbed and I hope today you will understand why. As the people of our county were getting conflicting stories, they did not know who to turn to for help. The government officials who were looking to for protection were the same government officials who were promoting the disposal of hazardous waste by dumping.

It's our contention that unless a solution is found and unless the people of this nation come to grips with the problems of hazardous waste, that this emotional disturbance is not going to be limited to the people of Henderson County, but will stretch across the entire nation.

Thank you.

Mr. GORE. Thank you, Mr. Dyer. And, by thanking you, I want to also thank the people of Henderson County for focusing attention on this problem in a way that simply could not be ignored by anyone. And I truly believe that their efforts have pushed us as a nation closer to facing up to this problem and trying to come up with a sensible solution to it. And I really mean that.

I think we are on the way toward facing up to it and toward solving the problem.

It is not the place of this subcommittee of the U.S. Congress to enter into disputes in the State legislature in Tennessee and complicate the considerations underway there. Our purpose is to examine the events that have taken place in Tennessee and the efforts that are underway in Tennessee as a case study to see how we might take action at the Federal level to make this program more sensible and to get closer to a solution to this problem.

Dr. Bruner, do you agree with the statement of Ms. Harrington that a Federal approach is necessary because States cannot handle the entire problem by themselves?

Dr. BRUNER. I generally agree with that statement. I think it is not an absolute yes or no, but I think it will require a strong Fed-

eral/State partnership, and I would strongly encourage a strong Federal partner in this effort, which is not consistent with the last 6 months to a year of leadership that we have had. So I would look forward to anything that you could do to see that those partners are strong and dependent on each other for progress.

Mr. GORE. Well, I have been trying my best to strengthen the role of the Federal partner in that relationship and I think we have made some progress in that regard.

Incidentally, my staff has done some checking during the panel's testimony on the Superfund listing of sites with the Federal involvement and we found that the interim Superfund list contained Federal sites but that a policy decision was made by Anne Burford to remove any Federal sites from the Superfund list because the Office of Management and Budget did not intend to make available any money to clean up any Federal sites. Therefore, they decided not to put any Federal sites on the list.

I certainly agree with you that that is not a responsible approach. The sites should be listed according to the degree of hazard.

Now we will explore that a little bit later with the representative of EPA, who will appear on the final panel, and he may be able to offer some more insight into that matter than we have been able to gain in the few minutes that we have looked into it.

Now let's talk about landfills, Dr. Bruner. Is it your position that Tennessee must have a landfill for hazardous chemical waste?

Dr. BRUNER. "Must" is perhaps not the word I would have chosen. But we badly need a hazardous waste landfill in the State of Tennessee.

"Must," to me, would imply that we could not get along without it and we have done without it for some time now, but only as long as we have access to disposable facilities outside of our State.

Mr. GORE. Well, what I am getting at is the issue of public confidence.

If you propose the location of a landfill for hazardous chemical waste, Mr. Dyer, what assurances would you as a representative of the public in an area that went through this experience—I don't want to put either one of you on the spot, I am genuinely and sincerely trying to get at this issue of public confidence—if a landfill was proposed in the State of Tennessee what sorts of assurances would you believe would be necessary in this day and time before that process could go forward.

Mr. DYER. I think it would be impossible to give the local government the assurance it would need at this point.

As I pointed out in my testimony it is the conflicting reports that we had been given by both Federal and State government from the very beginning, since December.

As a result of these reports, at this point, I think it would be impossible to give the local government the assurance that it needs.

Mr. GORE. Do you want to respond, Dr. Bruner? How do you feel about that?

Dr. BRUNER. Somewhat facetiously, the way we deal with it when we are the regulator, not the promoter of the development of hazardous waste disposal facilities, it is our—and quite seriously—it is our primary responsibility to see that any site meets the best regu-

lations and guidance that we have, both from the Federal agency, our state legislature, and our program.

Mr. GORE. Yes. Well, let's suppose that—well, let's talk about the Alabama site for a minute. How long do you think that will be closed down?

Dr. BRUNER. This was news to me this morning when they announced that. So I have no knowledge of the Alabama situation.

Now, I have visited the Alabama site and I have visited the Louisiana site within the last 6 to 8 months along with other members of the safe growth team and Governor's staff. And I am convinced that technology renders a well-managed hazardous waste landfill at a very low risk in the public health to be protected with the current technology and good management that is available in such situations.

Mr. GORE. Ms. Harrington, do you have any information on the Alabama site?

Ms. HARRINGTON. No; I don't have any on the Alabama site. But you were interested in what might provide confidence to the public.

Mr. GORE. Yes.

Ms. HARRINGTON. In working on this bill in the Tennessee Legislature we worked a great deal with the citizens group from Hickman and Henderson Counties. And what we discovered about what will most undoubtedly help public confidence is information at public hearings, providing information by the company that proposes to be there, allowing the county government to go on site to run independent tests, to have the health monitoring, toll free numbers, putting information in the county courthouse and public libraries. Constant contact, constant information.

Based on what Mr. Dyer said, I would hope that information would be consistent. If it is, there is some indication that they would regain the public confidence. But if it is inconsistent then I guess they would lose whatever confidence had been built up.

Mr. GORE. Do you agree with that, Mr. Dyer?

Mr. DYER. Congressman, if you remember, on December 23 the people of Henderson County were told this was the safest technology available in the Nation today and Henderson County was the best geological location for a hazardous waste dump in the State of Tennessee.

Mr. GORE. Yes.

Mr. DYER. Less than 30 days later EPA had changed its regulations and told us that the geological location was not that important, that if it was adequately prepared and constructed, that it could be located anywhere in the State of Tennessee.

Now, when I asked, why did they select Henderson County, one reason was because of the low population. And why was it because of low population? Because, and this was the EPA representative speaking, he said in case it does leak it doesn't expose as many people to hazards.

So I think the rural——

Mr. GORE. Did that make you feel better?

Mr. DYER. I think the rural areas feel like we are being totally discriminated against from the standpoint that we are not even receiving any benefits of the industry or the jobs from the people who are creating the hazardous waste. But we are asked as a rural

county to accept this hazardous waste, which is driving industry from our country.

Mr. GORE. Or would, in your view, if it was located there.

Mr. DYER. That's right.

Mr. GORE. Now let's suppose that the Federal Government and the State government developed a truly innovative and reliable system for separating out the truly toxic chemicals and that after some experience with this system we could develop some confidence that it was working properly, then I think most people would feel differently about the whole process; don't you agree?

Mr. DYER. I agree. I think if Government was controlling it instead of private industry, that the people would have more confidence in it.

Mr. GORE. All right. I have some other questions but I would like to turn to my colleague, Congressman Durbin.

Mr. DURBIN. Not being from Tennessee and not being fully aware of all your local circumstances here, I don't want to presume to ask too many questions.

There are a couple of observations that I would make. One, Ms. Harrington, I think you made a very interesting point there about the fact that if we don't do this on a Federal level we could be creating economic disincentives for economic expansion in a given State, which has never been quite put that well, and I appreciate that comment.

Were you working in concert with other States to see what they were doing in this area as to whether or not Tennessee is ahead or behind comparable States?

Ms. HARRINGTON. We are a little bit behind. There are two fee programs like this. One fee program is in place and if legislation passes which is currently pending, I think there will be two fee programs. One will fund the—an assessment program that he was discussing that is below $700,000 that Dr. Bruner was discussing. The other would fund the cleanup and an incentive fund.

The interesting aspect about our bill is our $2 million incentive fund which would go to the county for allowing a hazardous dump site to be located there.

Mr. DURBIN. You know, Mr. Dyer, as I listened to you testify about Henderson County, I am hearing all these echoes coming back in my mind about Wilsonville, Ill. We went through this same thing.

They actually put the barrels in the ground in an abandoned coal mine and the people watched them bring them in, truckload after truckload in this tiny little town. And they just had to believe something was wrong when the waste was slopping out the back of the barrels there. Finally they started an organized effort in Illinois which was just unprecedented.

Today they are fortunate. The company has been ordered—the Boston-based company has been ordered to remove every single barrel of waste that they have stuck in this old coal mine. And they have people walking around in these white suits that look like they are men on the Moon, removing these barrels and taking them out to God-knows-where. I hope it is not Tennessee.

Mr. GORE. It is not.

Mr. DURBIN. Good. I am wondering, though. You have been through this experience. I have witnessed it from 100 miles away. And it is part of my community.

What I find kind of interesting is what the reaction of people will be afterward. We still use these products that generate these wastes. Sometimes we have plants in our own districts and own areas that generate employment. And this is one of the costs of that kind of business and the society we live in.

I think the fact that you have been burned may lead you to say at this point: Is it possible for you to guarantee to Henderson County that there is going to be a safe disposal?

But I am wondering on your own thoughts, having been through this, trying to look down the line maybe one generation. Where do you see us moving in terms of responsibility here? Who is going to handle the responsibility of this waste?

Mr. DYER. I think Government and industry are going to have to work jointly to look for ways to develop the technology, if in fact it is not developed, to dispose of the hazardous waste in a manner that it will be gone forever, through incineration.

I do not think that the burial is the answer to the problem of hazardous waste. We are only storing it. And there is no proof that it is being stored safely.

In 20 or 30 years from now we will do the same thing, spending millions of dollars cleaning up the same dumps that we are creating today. It would look like from a feasible—it would be more feasible now to let the Government invest the money today to encourage the technology of incineration and recycling than it would down the road to have to spend additional tax dollars to clean up what we are storing.

Mr. DURBIN. That's a good comment. And I like your statement earlier. It is an interesting twist that other businesses said they would leave if the landfill were located in your county, which shows that even within the business community there must be some diversity of thinking about this.

Mr. DYER. We found that our local manufacturers are just as interested in this problem as we are and they are opposed to the burial of hazardous waste. But they are looking to Government to work with them to come up with the technology or the feasibility of recycling or incineration. But they are just as concerned as the Government is.

It is not a—it is not all the fault of manufacturers. And that is the reason that I encourage the manufacturers and the Government to get together, to look at other alternatives than landfill—and look for incentives from Government to encourage industry to develop technologies.

You know, if we would make the regulations so restrictive on burial and drive the cost of burial up, I have a feeling that industry would develop the technology.

Mr. DURBIN. My impression, and I think the earlier witnesses testified that it is getting more and more expensive for burial, more expensive to find transport and more expensive to find sites that are going to meet general approval.

May I ask one other question of Mr. Dyer? Did you have the authority within your county under any zoning ordinance to review the placement of this site?

Mr. DYER. No, sir, we did not. We do not have zoning in Henderson County.

Once the proposed dump site plans were announced the company had filed for a State permit, which was incomplete. After it was turned back and rejected, then our county commission enacted a moratorium against any new use of land in Henderson County, along with a formal planning commission in which we started zoning.

According to the newspapers, the company withdrew their plans to locate there rather than go to court to contest our right to develop zoning in our county.

Mr. DURBIN. Thank you very much.

Mr. GORE. Dr. Bruner and Ms. Harrington, you heard the testimony of the first panel where these two leading experts in the country said that alternative technologies are presently available and could be used. Do you have any reason to disagree with their statements?

Dr. BRUNER. It would depend on how argumentative I would like to be. I suppose I could easily, and I could see how one could easily disagree with the statement.

I think that it is one of those relative—it is a relative question. The technologies are generally available but there are many chemicals that we do not have the technology available to know what to do with it. So it is not a yes or a no. It is not a yes or no question.

I really think that maybe a more central issue here is: Is it accessible? And the answer to that is clearly no.

That leads us back—we must have something to do with the hazardous waste that is being generated between now and the time that technology is not only available but accessible to industries for the disposal of hazardous waste. And I know of no other alternative at this point other than landfilling through that period of time.

Mr. GORE. Now, the final panel this afternoon is going to address the incentives for these technologies. But tell me again why you don't think they are accessible, these alternative technologies.

Dr. BRUNER. Perhaps it was a play on words. I am talking about built, ready to roll, ready for production. And this appears to me to be from 5 to 10 years down the track for any major volume, any major volume, whether they are dealing with a million metric tons or whether we are dealing with more.

In order to make a substantial bite in that I am talking about 25, 50, 75 percent bite in that; I believe our experts previously said if we could eat it all or we would just have to eat it, that we could eat 90 percent of it.

Mr. GORE. Is that right?

Dr. BRUNER. He said 90 percent. In order to get into that range of 25, 50, or 75 percent, it appears to me to be 5 or 10 years down the track.

Mr. GORE. How many years down the track do you think it might be before a landfill is accessible inside the State of Tennessee? That is a rhetorical question and——

Dr. BRUNER. That's a nasty question.

Mr. GORE. It is not designed to be argumentative too much.

Dr. BRUNER. What was the question again? I will try to avoid it the best way I know how.

Mr. GORE. Well, you used the word "accessible," and you said the alternative technology is not up and ready to go. But if we were forced to deal with the Tennessee hazardous waste within the boundaries of our own state, these alternative technologies might turn out to be more accessible than landfill dumping. Wouldn't you agree?

Dr. BRUNER. I would.

Mr. GORE. How can we quickly stimulate the development of these alternatives? It seems to me that it would be sensible for the entire country and the State of Tennessee to stimulate the development of alternative disposal technologies.

Do you have any thoughts, speaking for the Tennessee Department of Public Health, on how we might do that?

Dr. BRUNER. I think a number of them have been mentioned today that I would see no reason to repeat, but one that has not is to get tougher. Get tougher in enforcing, get tougher on illegal dumping.

There is enough evidence over the last 30 years in our State to indicate to me that there has been and continues to be a substantial amount of illegal dumping from industries in the State of Tennessee.

Mr. GORE. Do you have plans to get tougher?

Dr. BRUNER. We do.

Mr. GORE. How quickly?

Dr. BRUNER. Yesterday.

Mr. GORE. Sounds good.

Ms. Harrington, do you want to comment on that?

Ms. HARRINGTON. Yes, I would. For one thing, it sounds as though we don't need to argue. There is commercial landfilling in Tennessee. There is on site-landfilling in Tennessee, which is going on.

Dr. BRUNER. I have those numbered on my testimony there to some extent.

Mr. GORE. Could you give us an indication of what percentage in Tennessee that hazardous waste is dumped into landfills on company property?

Dr. BRUNER. Most.

Mr. GORE. Most? What percentage?

Dr. BRUNER. Well, let me read the statement. Again, if we want to accept the 700,000-ton figure, 23,000 tons are treated in Tennessee at eight commercial facilities, 48,000 are shipped out of State. So it is the vast majority that is on the premises of existing major industrial sites.

Ms. HARRINGTON. And it is that the State Department of Public Health is seeking to get—what do you call it? Delegation under RCRA to control——

Dr. BRUNER. That is interim. They are under interim status.

Mr. GORE. Interim status?

Ms. HARRINGTON. The problem there gets back to money. Year after year they thought they could raise three-quarters of a million

dollars. Because of EPA's redefinition of what hazardous waste is, it only raised $350,000, approximately half of what they expected, because EPA hazardous regulations—because they couldn't count on, from 1 fiscal year to the next, how much money could be raised by putting a tax on generation.

We practically did away with hazardous wastes in Tennessee from the first of December until the first of March by redefining it.

Mr. GORE. You can define the problem differently and pretend it doesn't exist. But folks know that it does exist.

Ms. HARRINGTON. And we know, too, that the State Department does not have sufficient funds to clean that up.

Mr. GORE. What about classifying and keeping track of hazardous waste, Dr. Bruner? Does Tennessee have an adequate program for doing that?

Let me refine the question a little bit. The experts who testified earlier said that it is going to be important to classify waste according to the degree of hazard and according to the disposal technology that is most appropriate for each kind of waste. Do we in Tennessee have the resources and the manpower and the expertise to do that task or not?

Dr. BRUNER. No.

Mr. GORE. We don't?

Dr. BRUNER. No.

Mr. GORE. How long would it take to develop it if we had to do it at the State level?

Dr. BRUNER. Again, that would be dependent to some extent, the major extent, on the resources that were invested to do that. I would say it would only be speculative as to how much money, how long it would take.

I also realize at this point that we are in a very difficult situation—you are, people of Henderson County. This is an extremely difficult situation we are dealing with, and we are all trying. I really sincerely believe you are trying, and we are, too.

Mr. GORE. I appreciate that.

Dr. BRUNER. And we are, too. Now, the dilemma has no easy answer. And it is pretty easy to sit back perhaps in an academic or research setting, not to be too critical of our previous panel, and have theoretical models that conceptually make technology available. But when you get down to where the rubber hits the road, trying to keep track of 6,000 industries with many thousands of types of wastes to classify them and have practical manifest scheduling and classifying, they are two entirely different questions. One is conceptually sound. The other is practically impossible at this stage of the game.

So I would say, based upon the other programs we have had, 5 years, with continued increased investment at 20 to 12 percent a year, would be my best guess.

Mr. GORE. All right. Very good. We have done some quick arithmetic here. And based on your figures, Dr. Bruner, the amount of hazardous waste in Tennessee disposed of on-site is 90 percent; 90 percent of it is disposed of on-site.

Second, in response to your earlier statements which I commented on earlier about Federal sites, we have figures indicating that what you are referring to involves approximately 90 sites, 17 asso-

ciated with the Naval Air Station, 1 with the—that is in Memphis—1 with the Memphis Army Depot, 33 with Oak Ridge National Laboratories, 26, an ammunition factory in Chattanooga, Volunteer Army ammunition factory, 2 at the AEDC facility near Tullahoma, 1 at the Milan Arsenal, and 7 at the Holson Army ammunition dump.

Now, a lot of these are classified as hazardous because of the explosive potential of munitions. Is that correct? I mean a lot of those involve munitions that were disposed of. And some of them, at AEDC's sites, I believe you are talking about PCB's there; is that correct?

Dr. BRUNER. Among other things.

Mr. GORE. Among other things. And the Oak Ridge National Laboratory sites, what is it that concerns you about those sites?

Dr. BRUNER. They have major radiological water problems, contamination and hazardous waste all stirred up in the cauldron.

Mr. GORE. In further comment on that, I am informed that the Superfund statute does not make available money for cleaning up Federal sites unless an emergency fund is required. There is no remedial action funded under the Superfund law. So I wanted to state those facts for the record.

Dr. BRUNER. May I reemphasize my point again? What I would like to say is I think you should recognize that as a component of the problem.

Mr. GORE. Yes, sir.

Dr. BRUNER. The second is, help us clarify where the authority lies in jurisdiction and enforcement on Federal agencies.

Mr. GORE. I fully intend to do so. And I appreciate that suggestion, genuinely do.

I noted your comment that there are vague lines of authority where those kinds of sites are involved. I agree with you that we need to stop sticking our head in the sand about any aspect of this problem.

The public is demanding that government at all levels, Federal, State, and local, face up to their responsibilities to solve this problem. And we have got to stop sticking our heads in the sand and pretending that this problem is going to go away. It is not going to go away. We are creating more sites every single day.

We are going to have to recognize that it is a difficult problem. It is complicated as all get-out. We are just going to get down and wrestle with it and do the very best we can to solve it. We have not done that so far.

Now, that is, of course, the direction in which this hearing is pointed, and we are trying to gather the facts and create a better understanding of how we can solve this problem while there is a public will to see a solution developed. And I genuinely believe we can do that.

I want to thank the members of this panel for helping us in that effort.

We are going to take a short lunch break. We are going to come back at 1:45, 15 minutes until 2. And we have got two more panels.

The next panel will be on the alternative technologies themselves. We have experts on each of the alternative technologies: high temperature incineration, chemical, thermal, and biological

treatment, recycling, and the rest. And then the final panel will address the legal and economic considerations.

So we will have a short lunch break and reconvene at 1:45.

AFTERNOON SESSION

Mr. GORE. The subcommittee will come back to order.

I would like to welcome our witnesses to this panel. I trust everyone had a good lunch break.

I succeeded in convincing Congressman Durbin that Jackson, Tenn.'s reputation for excellent barbecue is well deserved. And that having been accomplished we will proceed with the third panel of today made up of Robert Pojasek with the Roy F. Weston Co. in Burlington, Mass.; Doug Ezell, plant manager with Systech Liquid Treatment Corp. in Antioch, Tenn., and Mr. Ezell is representing the National Solid Waste Management Association; Charles Robertson, with Ensco, Inc. in Little Rock, Ark., representing the Hazardous Waste Treatment Council; and Dr. Linda Gaines from Argonne National Laboratory, Agonne, Ill.

I would like to welcome all of you and thank you for coming here. We will put your statements in the record and we will invite you to proceed in the order that you have been introduced, beginning with you, Mr. Pojasek.

STATEMENTS OF ROBERT POJASEK, VICE PRESIDENT, ROY F. WESTON, INC.; DOUG EZELL, PLANT MANAGER, SYSTECH LIQUID TREATMENT CORP., REPRESENTING NATIONAL SOLID WASTE MANAGEMENT ASSOCIATION; CHARLES ROBERTSON, ENSCO, INC., LITTLE ROCK, ARK, REPRESENTING THE HAZARDOUS WASTE TREATMENT COUNCIL; AND LINDA GAINES, ARGONNE NATIONAL LABORATORIES

Mr. POJASEK. Thank you very much, Mr. Chairman. My name is Robert Pojasek. I am a vice president of Roy F. Weston, Inc. We are a consulting firm and have no direct involvement in the commercial waste management business.

The topic of utilization of alternative technology is such a massive topic it is impossible to properly address it in the short time you have made available here today.

I have personally directed nearly 15 major studies on waste management, including the use of alternative technologies.

I have also acted as an adviser to the previous Presidential administration and to the World Health Organization, Europe Office in Copenhagen. These activities have allowed me to travel to many different countries and throughout North America to observe various waste management activities. I would like to share a few impressions with you that I have gained as a result of these independent studies.

First of all, we had some talk this morning about the "hardness," if you will, of the data that is available on waste management and you did hold up a wallet at one point and asked whether you could find out what the wastes were that came from the production of that item.

In fact, this sort of information on the detailed types of wastes and the quantities of waste within a given region are very much necessary for the development of alternative technologies.

Unlike landfills where most anything that the regulations allow to go into the landfills can, in fact, go into the landfills, the technology tends to be much more waste specific.

You could get a particular type of waste that could go into a technology that if it weren't properly selected to go in could cause an upset in that technology with the release of materials that one would not anticipate having. So it is very important to have detailed information about waste generation.

Ideally, by what is called standard industrial classification, every industry is given by the Department of Labor a four-digit SIC code, as it is called, to tell the type of industry.

Ideally one would like to have the waste generation characteristic, by employment number, per wide variety of different types of wastes tied into the SIC code.

In fact, there are a number of firms that do have these particular data bases available.

I have a description that I submitted to you in my attachment and my comments which talks about one such data base.

This particular data base is quite useful in forecasting various waste types. It has already been used in seven States in the United States and one Province in Canada. And basically what this forecasting mechanism can do, if we have a recession now, if you are going to come out of the recession with a certain industry trend, one can forecast what impact that is going to have on waste generation.

You can also forecast the impact of new industry that might be attractive, given certain types of technology. You can also forecast the impact of initiatives to abate waste.

I might add that abatement of waste is also a deterrent to the generation of these technologies, of bringing these technologies on line, because if the technologies come on line, assuming that there will be certain waste for them to treat and those industries are successful in abating those wastes, these technologies can no longer afford to operate and maintain their particular alternative technology. So it is very good to be able to forecast what impact, then, they have prior to that effect.

These type of data bases are total interactive on computer bases and can be accessed by the State agencies themselves to do these forecasting in-house on a time sharing basis. And, as I said, there are a number of them that are available.

These sorts of models are really going to be needed for the credibility to show, in fact, there are wastes.

I think a lot of the waste generators themselves say that they have done marketing studies. And then you ask them: Well, let me see your numbers, or let me see how you got your numbers. And they say that is proprietary information, "We spent a lot of money doing that. We don't want our competition getting hold of that information." Therefore it does not give a lot of credibility to those firms.

If you had a State agency for some sort of industry organization that did the waste generation survey in an open forum so that in a

public manner a member of the public could ask questions, could see the data to see how the manipulations were made, you would have a lot more credibility as far as waste generation.

I think once you have some hard numbers and you have the ability to forecast and manipulate them, what a State or region such as western Tennessee needs is a survey on generic technologies. And I underline that word generic technology.

These would be, instead of taking a super secret proprietary process, the company can't tell you anything about the process, but they are dying to have you use it, such as a number of solidification processes that are on the market; they just won't tell you anything about them, but they will tell you why they are solidification processes.

What you can do in a generic survey is take cement base solidification, lime base solidification and use it as a generic technology. What wastes are generated in western Tennessee that are applicable to that type of technology. Given the fact that there are wastes applicable to that type of technology then any vendor who has a process, as secret as it may be, that fits the criteria of that type of process, then in fact he would be able to attract waste in there because a State survey said that in fact there are those ways available.

So really in order to avoid proprietary process where you don't have the information, you need to do this generic technology study. This inventory and this generic technology study should be done in every statewide hazardous waste management plan.

Congress has mandated that all States do a solid waste inventory that was put forth in the Resource Conservation Recovery Act. They have not demanded the States do a hazardous waste management study for the States. A number of States have done this.

These tools become very useful for both the State and the public to understand and to participate in the formulation of facility development plans by arguing the various points for and against the various technologies.

There are some problems in bringing various alternative technologies on stream. First of all it has been mentioned a number of times, and you have a panel after us talking about it, is they say the economics are not feasible, are not favorable when technologies have to compete with inexpensive landfilling. In Europe you see this.

I think basically the technologies that are on line are trying to conform to the regulations in the most economical achievable fashion. So if you have countries like France, for example, where most of the wastes are land-filled in France, England where almost 100 percent of the wastes are land-filled, it is a phenomenal percentage. But France is where it is on the continent.

In Germany the regulations are much more stringent as far as landfilling. Liquids and landfills were banned 7 or 8 years ago in West Germany. And so what has happened is an industry that is near the French border has an alternative for either shipping its waste into France for low-cost disposal or going to, if it is not monopolistically determined, to one of the State-operated hazardous waste management facilites.

In fact, the state facilities are operating under capacity now, grossly under capacity, because of the exporting of waste to other areas.

The same with East Germany, which is looking for hard currency right now, does also have very inexpensive landfill disposal. Many German firms are torn when shipping it there or having something done within their own state.

We do have the same problem here in the United States between the various States.

Mr. GORE. What you are saying, and you have written several books, as I understand it, about this problem, and you are considered one of the leading experts on disposal strategies in foreign countries, and what you are saying is that in Europe you have a country like Germany with tough regulations, but a country like France with a very lax approach, and East Germany has a lax approach.

So what you find is that West German companies, rather than using the disposal facilities in West Germany that are a little more expensive, they will ship their wastes across the national boundaries to France or to East Germany where it is much cheaper?

Mr. POJASEK. Yes. Because, you know, the regulation—they are conforming to the regulations in East Germany, which may, in fact, be much less stringent. Again, it is the smaller firms or the firms in industry that are operating close to the margin that are faced with this decision. Many of the larger firms in Europe and certainly here in the United States even manage their own waste onsite or become stockholders in some of the major facilities over there.

Certainly there are many companies here that are major contributors to certain waste management industry that have a vested interest in the fact that they stay healthy because they have managed their waste in a manner that they see as being correct.

So that is one problem, the economic problem, in shipping wastes around.

I think the second problem is that the vendors of these technologies need to develop realistic waste analysis plans. These plans are required under the Resource Conservation Recovery Act.

But when you see many people coming in to propose a facility or with what is called a part B permit, which is a final permit to operate treatment storage and disposal plant under the regulation, that they like these waste analysis plans, can bury simple terms—it is not a lot of detail is what I want to say.

Basically what you want is an awful lot of detail in that waste analysis plan, as to what are the characteristics of the wastes I can accept and why I won't refuse them, in tremendous amount of detail.

So that the State official who is responsible for regulating that particular facility has something to regulate against. He has a detailed waste analysis plan. And any inspector can go out there and see whether, in fact, they are following the terms of that waste analysis plan.

Again, that plan is important because you do not want waste to get into that facility or into certain processes within that facility when those processes cannot handle it adequately or when it may

upset the process and cause some sort of release, either gaseous release or some sort of malfunctioning of equipment.

I think the next area is the fact that most waste management firms do not seem to sponsor research firms, do not seem to sponsor research and development activities themselves. This is prevalent throughout Europe and throughout the United States. They spend so much time just trying to conform to the regulations and show that they are conforming to the regulations that they do not in themselves do research and development.

There is a little bit of a problem because many of the entrepreneural activities that go on do not have a very good ability to get real waste. They often use synthetic wastes and other types of things that are being done in somewhat uncontrolled situations as the process is being developed. And they may not have a very realistic idea of how well, in fact, that process can operate. And they have very little in the way of support operative waste management firm to help them in the development of that process.

So research and development needs, which as a part of the subject of the National Academy study is really something that needs to be addressed both by the operating companies and also in any legislation that there is a way to get these facilities on board.

I think what happens is many entrepreneurs say that a piece of equipment is available when it is just still a twinkle in his eye or maybe a bench scale model.

One such entrepreneur claims that his process can clean up New Bedford Harbor, for example, in Massachusetts, which is a whole harbor contaminated with PCB like many other harbors in the United States, and it is just a bench scale model that he has right now. And the scale-up problems in many technologies takes many years to work themselves out. So there needs to be a way to bring these entrepreneural techniques on line. But I do agree that there are many technologies presently on line.

I guess some of the problems with these current technologies, and I mentioned in my notes on Europe, is it is not so much do the technologies work, the problem comes in in terms of the blending in the feeding of wastes into the various technologies.

Part of the best run incinerators in Europe, if you ask any expert over there, is the incinerator at the Bayer Chemical Plant in Lieberose. In fact, that incinerator blew up about 1 month into operation. And the incinerator at the AVR facility in Rotterdam blew up the first day of operation.

Both of those mishaps were due to maybe something bordering upon ineptitude, but certainly naivete about the blending of various wastes before feeding them into the incinerator, so that fumes were exposed to the outside of the incinerator, a hot incinerator at that, and caused explosion.

Now, in fact, both of those facilities are operating very well. They have learned their lesson. So I think even though the technology may work, you do have some problems in the blending and feeding of those technologies and you do have problems in the operation and maintenance of those technologies once they get on line.

Will, in fact, the company keep them up and operating as well as they say they do?

Now, once again, they are required to have at least 10 operational plans and I outlined them in a submission to you under the Resource Conservation Recovery Act.

The company cannot just generally say what they are going to do in each of those areas. They should have specific step-by-step plans as to how they are going to do their inspections.

How will they train their operators so that their operators will not make critical mistakes during a shakedown of the facility? How are they going to provide for security and other things? All these plans are required. But, once again, many facilities submit very general plans and the state does not have anything to regulate against.

So I think here what we need is not necessarily more regulation. We need some more rigorous enforcement of the regulations we have already on line.

I think, finally, what I would like to talk about, just a quick point, is people always think that we can look to Europe for secret answers or that there is some sort of mystique over there. And many people, like myself, spent time over at Europe looking at these technologies.

I think when I made my first trip over there about 3 years ago I was rather flabbergasted walking into a panel of 30 experts, only two of us from the United States, and instead of me asking them about their waste technology, all the questions were asked of me.

You find out there is as much mystique about what is going on in the United States over in Europe as there is the mystique we have on the European case. That is especially true in the physical chemical treatment area that we have really led the way.

It is interesting to know that ocean disposal of hazardous waste without treatment, not incineration, had been the practice in Europe for many years and continues today. And that is banned specifically here in the United States.

Many people have in Europe banned the land treatment that was talked about this morning, which is less expensive than landfilling, has been categorically banned in a number of European countries when in fact it is the practice in some places here in the United States.

So there are some major differences in the practice of technology. I think many of those are because of specific regulations that those countries have.

I think that the level of treatment and protection of the environment anywhere in the world is directly proportional to the existing hazardous waste regulations and their enforcement. Again, underlining the word enforcement. I think England and France, as I told you; with their landfilling, they are going to go in that direction. West Germany really goes toward the technology.

I would like to, again, reemphasize the experience in handling and blending. Again, I think many European facilities have learned from their mistakes.

We are involved in a facility development plan in the Province of Ontario, and one of the things we were going to tell the developer there is that he should have somebody who had been through the shakedown of a similar type facility on contract for about 6 months with option to renew; and that he would have the life and death

decisions of a plant manager on what wastes to accept during that period of time. Plus, he would have the responsibility of training the crew. So that he would have an individual who had sort of risen through the ranks and has gone through the shakedown there to restore public credibility in the fact that that facility could run, because the technology was proven technology.

I think if you go to private enterprise sites in Europe, you will find out that they are not nearly as clean and as impressive looking as public monopolistic edifices that have been constructed over in Europe many times on state money. I will have you know that the Danish facility that has been bandied about has a 10-year interest free loan, which I think a lot of us would like to have on our homes and things like that, to promote the development.

In one country, the HIM facility in Hesse, Germany, has a power of veto on any permit that anybody wants to put in in that state for treating hazard waste. The state regulatory agency will go in to them and say: Should we allow this particular activity to go on? And they will say: Heck no, we need that particular type of waste in our plant. And because it is a publicly run monopolistic facility, they have the right to do it.

Also in Denmark, the regulators are paid consultants to Chem Control, which is a Danish company, which is selling the Danish technology outside the country. So if you hire Chem Control in western Tennessee, you can have an official of the Danish Government working for you as a paid consultant outside his own country. It is virtually impossible to get nonbiased regulatory information on that Chem Control facility from the Danish Government because they have a vested interest in that facility.

When we conducted our tours in Europe, we figured that the plant operators pretty much loved their facility above God and family sometimes, and that they certainly weren't going to tell us anything bad about their facility.

We usually convened independent expert panels prior to visiting each facility and then after the facility to learn some of the good things and the bad things. And that included talking to regulators who weren't affiliated with the facility. That is one reason why the tour conducted over there did not visit the Danish facility.

I have submitted some more comments that I have on the European facility to you, so I won't take up more time on that now.

I do appreciate this opportunity to talk with the subcommittee. And I hope the materials I have submitted to you will be very useful to you in your deliberations.

Thank you.

[The prepared statement of Mr. Pojasek follows:]

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UTILIZATION OF ALTERNATIVE TECHNOLOGIES INSTEAD OF LANDFILLING FOR HAZARDOUS WASTE MANAGEMENT

Before the feasibility of utilizing alternative technologies within a specific region can be studied, a firm characterization of waste types by physical and chemical properties is required together with a means of relating them to Standard Industrial Classifications (SIC). A computerized model utilizing this matching and waste generation factors tied into production employment would enable proper forecasting on the need for various technologies. Such an analytical tool is currently being used by the Minnesota Waste Management Board and the Massachusetts Department of Environmental Management as a basis for statewide hazardous waste management planning. Attachment A describes a means for conducting such an evaluation. Most vendors of alternative technologies do not have an adequate marketing survey methodology to properly justify the need for their equipment in a given area.

Once a state has a good waste generation inventory, an attempt must be made to survey generic technologies for handling the wastes. The term generic is highlighted to avoid having to consider certain proprietary processes at this phase. It is hard to get information from these vendors. Their processes always fall within a generic category. Once a category is specified as being required in a given area, all vendors with proprietary processes fitting the category will have an opportunity to try and fill the need. Attachment B describes this approach.

There are some problems in bringing various alternative technologies "on-stream." First, the economics are not favorable when these technologies have to compete with available and comparatively inexpensive landfilling operations. One does not necessarily need to ban landfilling but merely control the types of wastes that can be landfilled (i.e., pretreatment for landfilling). Second, the vendors need to develop realistic Waste Analysis Plans to provide the public and regulators with the certainty and confidence in the manner in which wastes are accepted for treatment. In fact, many plans are required to demonstrate that the process will be operated and maintained in a proper manner. See Attachment C for more information. Third, most waste management firms do not seem to sponsor research and development activities. There needs to be a way to bring new ideas "on-line" for those situations and wastes for which the new technologies are useful and economically attractive. Finally, one can never use the vendor's definition of "available." Most vendors tend to stretch this term beyond its normal usage. All these items can be addressed properly in a statewide hazardous waste management plan.

Finally, we do not need to look to Europe for the "secret" answers to our problems. Some general impressions of European technology is contained in Attachment D.

WESTON

ATTACHMENT A

THE WESTON APPROACH TO
PROVIDING A REALISTIC INVENTORY OF
HAZARDOUS WASTE GENERATION

The inventory is the keystone of any area-wide hazardous waste management planning effort. Great attention should be paid to properly funding, staffing, conducting, and reviewing this most important task. A poorly developed inventory may compromise the entire waste management planning effort. This brief discussion outlines a number of inventory approaches that may be considered. The WESTON approach is then described together with information which supports the uniqueness of this WESTON service.

There are three general means for conducting a hazardous waste generation inventory. They are as follows:

- review of reported waste data,
- industry waste surveys through visits or questionnaires,
- generation factor estimates utilizing known industrial statistics.

Many governments now require wastes to be reported via a manifest (i.e., waybill or trip-ticket) form if it is transported over public roads. Some jurisdictions require notification of disposal quantities or reports of generation. There are several problems involved in using reported waste data for a hazardous waste generation inventory: not all waste generated is transported over public roads; wastes may not be adequately characterized; some wastes may escape the system, legally or illegally; company exemptions often make the data base incomplete (e.g., small generator exclusions); and waste internally reused or recycled is often exempted from these systems. Various adjustment factors must be utilized in order to project the total waste generated.

The industrial survey technique requires the interviewing of a statistically accurate sample of potential generators. This approach is expensive. Its success is highly dependent on the technical quality of the interviewing force as well as the cooperation received from industry. It is difficult to utilize

WESTON

this approach if there is a broad range of industry types or large numbers of potential generators. As in the case above, an adjustment factor must be utilized to obtain total waste generated.

Most waste generation inventory efforts now utilize the generation factor methodology. This approach often involves a computer program that will accept as input estimates developed in other studies of waste generated on a per employee or per plant basis for a specific industry category (generally categorized by Standard Industrial Classification or SIC numbers). These generation factors are then applied to a particular region or jurisdiction using readily available employment or plant statistics. Some of these studies suffer due to the small size of data in the program input and differences in technology or productivity from the jurisdictional data relative to the area in which it will be used.

The WESTON methodology for determining hazardous waste generation is a combination of these approaches: generation factors are derived and then the key generators identified in the WESTON model are interviewed to verify the factors and alter them where required. The WESTON methodology is summarized as follows:

- Previous studies in other jurisdictions plus any available local data are translated to a waste/employee basis specific to each type of waste for each type of industry; at present, there are up to 15 estimates of waste generated/employee for any given waste type/industry combination.

- Data on local employment by industry type is obtained.

- The WESTON computer program takes the above data and uses a mathematical equation to obtain the factor for any specific waste type/industry type combination; the program then multiplies this estimate of waste generated per employee by the number of employees within that industry.

- Waste and geographic classification systems are selected.

- A technical Interview Program is undertaken to determine recent and future industrial technological changes and assist in growth projections.

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WESTON Approach to Providing A
Realistic Inventory of Hazardous
Waste Generation

- The program is test run to identify: key waste generating industries, data or programming anomalies and further information requirements obtainable during the industry survey.

- A survey of sample companies within the key industries identified is conducted. This survey seeks to verify waste generation rates and/or provide new waste generation rates.

- Waste generation rates are adjusted according to the results of the survey.

- The program is run again to provide an estimate of liquid industrial waste and hazardous waste generation in Ontario by waste type and source.

This WESTON methodology improves the standard generation factor method by including direct surveys of key generators in order to verify factor estimates. It also overcomes the time and cost constraints inherent in a large scale interview program.

By estimating waste generation on an industry-specific basis, future trends in waste generation can be predicted using industrial growth forecasts. The effects of potential process changes on waste quantity and type generated can be studied. By estimating wastes on a plant by plant basis, the geographical sources of waste are identified. Finally, because the WESTON model uses specific industry and waste types, it is possible to monitor waste generation by reviewing current employment or production data.

The use of a computer model does not, of course, obviate the need for applying professional judgement to data evaluation and the analysis of results. At each stage, the adequacy of the data, the program and the model results are subjected to detailed analysis and the "reasonableness" of the results are discussed within the WESTON study team and with industry experts. The WESTON team has extensive experience on a number of large waste inventory studies.

There are a number of factors which contribute to the uniqueness of the WESTON inventory approach. These include:

- large number of waste categories,

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WESTON Approach to Providing A
Realistic Inventory of Hazardous
Waste Generation

- large computerized data base assembled on several major inventory efforts which is assembled utilizing four-digit SIC numbers,
- existing waste treatability classification system tied into major generic waste treatment studies prepared by WESTON,
- experienced WESTON project team for proper utilization of this sophisticated data base,
- extensive data base verification and updating,
- computerized nature of data base allows for interactive use via remote "time-sharing" arrangements,
- cost effectiveness.

WESTON is using a very detailed waste categorization scheme fashioned after the 95 categories in the California system. This level of detail enhances the utility of the data base when used in the interactive mode for locating and/or quantifying certain types of waste during the waste management planning effort.

The WESTON data base has been developed through our many waste inventory projects. Presently, there are over 500 four-digit SIC numbers which have been selected from a large number as those being most likely to generate hazardous waste. Waste generation information derived from 15 major studies conducted in the United States and Canada are included in the data base. All this information is stored using the 95 waste categories mentioned above. This is the most extensive data base currently available.

WESTON has aggregated the waste categories into a flexible framework of 14 waste treatment categories. These categories are keyed into detailed WESTON generic waste treatment studies. There is also substantial waste abatement literature keyed into the SIC numbers.

WESTON inventory evaluations are conducted by a team of senior personnel that have conducted similar tasks for a large number

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WESTON Approach to Providing A
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Waste Generation

of previous efforts including major studies in Minnesota and Ontario. They have established contacts in business and industry associations to obtain timely information to assist in making the proper data interpretations. They are all familiar with the limitations and str ngths of this unique data base.

The WESTON data base has been verified in both Minnesota and Ontario and has worked quite well when compared to small sets of verified waste generation statistics. The WESTON data base is dynamic as it is constantly being updated to improve its utility.

Arrangements can be made to allow the use of the computer model on an interactive basis using remote terminals to command the WESTON computer. This service offers the user a wealth of information for conducting a more detailed marketing survey. Regulatory enforcement presonnel also find the listing handy to determine those companies who should be reporting wastes.

Because the WESTON inventory system is developed and proven, there are no extraneous costs to be borne by the user. Once the employment data bases are purchased and inputted into the computer, the WESTON services are promptly provided and often at a cost lower than expected.

For more information on this unique WESTON service or for information on WESTON's many other waste management planning services, please contact:

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ATTACHMENT B

EVALUATION OF GENERIC TECHNOLOGIES FOR HAZARDOUS WASTE MANAGEMENT

Paper Presented at the
American Institute of Chemical Engineers
National Meeting
Cleveland, Ohio
September 1, 1982

OVERVIEW OF TREATMENT TECHNOLOGIES FOR HAZARDOUS WASTE

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INTRODUCTION

An overview of hazardous waste treatment technologies can be best provided by examining the manner in which most firms evaluate their waste management options. A three-tiered approach can be divided into the following component parts:

- Manage the wastes on-site to eliminate or reduce the quantities or to treat them in a manner that they may be rendered non-hazardous.
- Evaluate off-site options to ensure that adequate methods are being used and that the waste is being managed properly.
- Work with state agencies to make certain that adequate hazardous waste management planning is being conducted so as to assure the future availability of off-site waste management capacity.

There are a number of reasons why industry uses this approach. Larger companies can and will manage a majority of their own hazardous wastes. Abatement, recycle, and reuse options are utilized in industries of all sizes where it is economically feasible to do so. Waste treatment or modification in order to obtain an exemption (delisting) from the hazardous waste regulations is becoming a common industry goal.

No matter what the waste management vendor says, the generator never loses its responsibility to see to it that proper waste management is provided. A number of companies have had some pretty bad past experiences in this area. Some off-site waste managers now claim that their customers are their most effective critics, being more influential and critical than either the public or the regulators.

Because of the difficulties in siting new facilities, more companies have begun to speak out, demanding proper statewide hazardous waste management planning. Minnesota has taken the lead with an effort to actually specify what facilities are "feasible and prudent" for their waste streams. Most other states active in this area still believe that the "vendor knows best" and have an effort to watch what is being done in the public light.

This paper will examine informational needs for these approaches and will look at some of the generic technologies which are available and how they are evaluated.

INFORMATIONAL NEEDS

Management of hazardous waste has three critical informational components at each of the levels discussed above. These needs are as follows:

- accurate and detailed inventory of waste types and quantities,

- survey information of all possible generic treatment technologies,

- information on integrating applicable technologies into viable systems.

The inventory, either in-plant or industry-wide, is the keystone in any program to select hazardous waste treatment technologies. There must be a suitable number of waste categories. In the Minnesota plan, 95 waste categories are identified and inventoried by industry (SIC number) and location. These wastes are then aggregated into 14 waste treatment categories for technology selection.

All available generic technologies must be surveyed. The word "generic" is highlighted because it is not important to look at vendor-specific proprietary processes at this early stage. Each of these methods can be grouped in a generic category. Once a specific category is selected, then the vendor can be approached. It is not wise to have the vendor select the category if you wish to have independent advice. Informational requirements are summarized in Table 1.

Once information is collected on the wastes and the technologies, it is possible to evaluate the technologies. Criteria generally include the following types of considerations:

- Technical
- Economic and energy
- Regulatory and environmental
- Social and aesthetic.

Once the ranking is done using the criteria, waste management systems can be derived.

HIERARCHY OF WASTE TREATMENT OPTIONS

Most industries and the public view hazardous waste as a hierarchy of options. While each group would like to remain at the top of the hierarchy, various technical and economic constraints keep forcing the selection of lower options. The hierarchy can be expressed as follows:

TABLE 1. Informational Requirements for Generic Technologies

- Process Description - an overview of the technology including theory and application.
- Technology Flow Diagram.
- Waste Inputs - description of the influent waste streams identified by the University of California at Davis (UCD) Waste Classification System.
- Effluents and Residuals - description of the products and waste streams including residuals handling requirements.
- Implementation, Reliability - description of technical feasibility including proven nature of technology.
- Process Application - description of current waste management applications as well as future potential.
- Economic Considerations - an overview of general capital and operating/maintenance costs, where available.
- Energy Requirements - description of power demands and energy intensity of application.
- Resource Recovery Potentials - an overview of materials recovery potential.
- Environmental Factors - an overview of potential environmental threats posed by the product and process residuals.
- Institutional Considerations - description of regulatory and possible permitting considerations.

- Waste abatement, reduction, reuse, recycle
- Waste treatment - biological, chemical, physical
- Thermal processing and waste destruction
- Solidification
- Ultimate disposal.

Unfortunately, there is not single method for treating all wastes. Complicating the matter even further is the fact that a particular method, while it is technically and economically feasible for a particular waste in one industry, it may not be the proper choice for the same waste as generated in another industry.

This hierarchy is driven primarily by regulations and their enforcement. Many industries are compelled only to meet regulations in the most cost-effective manner. This is how they stay in business. As the regulations already promulgated under RCRA are enforced, there will be a general trend toward the use of options higher in the hierarchy. A generalized look at each level may be found below.

WASTE ABATEMENT, REDUCTION, REUSE, AND RECYCLE

Waste abatement, reduction, reuse, and recycle operations represent an approach for reducing the capacity requirements for waste treatment and disposal facilities. These options generally involve processes closely related to chemical treatment technologies but with distinction that the hazardous waste is more or less transformed into a material suitable for reuse. At-source process modification, including the implementation of low-waste industrial processes to replace "waste intensive" technologies, improved housekeeping practices, and waste concentration technologies can be applied to reduce the quantity of wastes generated. The direct reuse of a waste stream as a process raw material can be approached through plant modification or waste exchange organizations. Reprocessing technologies (such as waste oil refining) can be adopted to reclaim some value from waste streams as a part of a waste recycle or recovery program. In general, these techniques are both process- and material-specific. Some approaches involve fairly simple technology, while others require mutliple step treatment systems, usually combining proprietary processes and advanced techniques tailored to the composition of the specific waste material. Valuable materials recovered in a cost-effective manner today include solvents, organic fuels, metals, alkalies, sulfuric and hydrochloric acids, and gases such as hydrocarbons -- all of which are in demand within a variety of industries.

Waste abatement can be defined as follows:

> Substitution of a new low-waste or non-waste primary industrial process for an old process to eliminate or drastically reduce the quantity of waste produced.

An example can be taken from the surface finishing industry. Many electroplaters use the cyanide salts of the various metals which they are plating out onto their products. Cyanide waste is a major problem for the electroplating industry, being potentially highly toxic and very expensive to treat. Several electroplaters have substituted alternative salts of the plating metals and have thus eliminated their cyanide disposal problem. This substitution has not been without its problems, however, many platers preferring to stay with the cyanide salts because of their superior plating properties.

Waste reduction can be defined as follows:

> The reduction of the quantity of waste through good housekeeping practices or by the application of concentration technologies. Also, the reduction of hazardousness of wastes through simple in-plant treatment.

An example of waste reduction comes from metal recovery operations in electroplating rinse waters. In the past, electroplaters have treated their dilute rinse waters containing low concentrations of heavy metals, zinc cadmium-chromium, etc. with lime to precipitate an alkaline sludge containing the heavy metals. This sludge is quite voluminous and is expensive to dispose of properly. The electroplaters are now installing rinse water treatment processes such as electrodialysis and reverse osmosis (see Physical/Chemical Treatment Processes chapter) to concentrate the metal salts which are returned to the plating baths, while the cleaned water is either discharged or utilized back in the rinse tanks. The sludge and the costs of sludge disposal are reduced and savings are also realized on the costs of raw material for the plating process.

Waste reuse can be defined as follows:

> The direct reuse, as a raw material, of a waste stream, as is or with very minor modification, by the plant that produces the waste or by others.

An example of reuse is described below which can often take place through a waste exchange. Solvents used in the electronics industry for contact cleaning or circuit board cleaning are only very slightly contaminated before they are considered to be unsuitable for further use. These solvents can be readily used directly by the paint industry with no intermediate purification step.

Finally, waste recycle and recovery can be defined as follows:

> The reclamation of value from waste streams through the application of reprocessing technologies consisting of unit processes such as distillation, etc.

These types of processes are described below. Table 2 indicates some processes used for this purpose.

TABLE 2.

Generic Categories for Recycle and Resource Recovery Processes

Waste exchange	Container recycling
Blending for use as fuel	Waste oil refining
Acid recovery	Zone refining
Metal recovery	Solvent extraction
Solvent refining & recovery	Distillation
Stripping	Crystallization

TREATMENT PROCESSES

The U.S. Environmental Protection Agency defines treatment as follows:

> "Any method, technique, or process which is designed to change the physical, the chemical, or the biological character or composition of any hazardous waste such as to neutralize the waste, render such waste non-hazardous, safer for transport, amenable for recovery, amenable for storage, or reduced in volume."

Biological Treatment. Most biological processes employ a mixture of micro-organisms to convert organic contaminants to less toxic substances through a series of reactions. The organic wastes, in part, supply the nutrient requirements of these micro-organisms. The complexity of the waste's chemical structure determines the biological ease of acclimation and the degree of waste degradation that can be achieved. The object of the biological treatment system is the optimized control of the environment in the reactor for micro-organisms to conduct biological degradation of waste organics. Many papers on waste treatment are quick to write off biological treatment as a serious option. However, it is used and with advances brought about by the recent awakening of the biotechnology research market, there will be a growing interest in this option. Table 3 lists some biological treatment categories.

TABLE 3.

Generic Categories for Biological Treatment Processes

Activated sludge	Waste stabilization ponds
Aerated lagoons	Mutant bacteria
Anaerobic digestion	Deep shaft aeration
Composting	Fluidized bed bioreactor
Enzyme treatment	Powder activated carbon
Trickling filter	Land farming
Rotating biological disc	Municipal sewage treatment plants

Physical/Chemical Treatment. These technologies act to alter or transform the physical and/or chemical nature of a waste stream. Physical treatment technologies generally separate components of the waste stream or change the physical form of the waste without altering the chemical structure of its constituents. Chemical treatment technologies alter the chemical structure of the waste constituents to produce a non-hazardous residue. Generally, physical/chemical treatment processes fall into three basic categories:

- phase separation,
- component separation,
- chemical transformation.

As mentioned in the section above, physical/chemical treatment is often used in recovery operations. Tables 2 and 4 contain a listing.

TABLE 4.

Generic Categories for Physical/Chemical Treatment Processes

Neutralization	Electrophoresis
Hydrolysis	Freeze drying
Reduction	Freeze crystallization
Precipitation	Chlorinalysis
Evaporation	Catalysis
Dechlorination	Photolysis
Oxidation	Electrolysis
Stripping	Dewatering
Ion exchange	Membrane technology
Liquid ion exchange	Thickening
High energy electron beam	Emulsion breaking
High gradient magnetic separation	Adsorption techniques

THERMAL TREATMENT

Most people immediately assume that this level is for incineration only. However, this is not the case. Thermal processing technologies, commonly referred to as thermal oxidation, utilize evaluted temperatures to change the chemical, physical, or biological character or composition of a special waste stream and, in some situations, can be applied to achieve energy and materials recovery. In most instances, thermal processing is a costly waste treatment step. In addition, operational problems can result with waste handling, high maintenance requirements, and equipment reliability. This is why it has been kept separate from treatment in this presentation. The technology disadvantages are being addressed, and thermal processing currently is functioning as an important waste management option. Table 5 includes a listing of applicable technologies.

TABLE 5.

Generic Categories for Thermal Treatment Processes

Rotary kiln	Liquid injection
Fluidized bed	Vertical tube reactor
Molten salt	Infrared furnace
Plasma arc	Co-incineration
Cement kiln	Shipboard incineration
Microwave plasma discharge	Evaporation
Multiple hearth	Calcination
Pyrolysis	Wet air oxidation

SOLIDIFICATION

The final treatment option to be considered here is solidification. Because of the propensity of "name brands" available, it has been most difficult to consider this technology in a generic fashion. Solidification processes improve the handling and physical characteristics of the waste stream, decrease the surface area for pollutant transfer, limit the solubility of the waste or chemically fix the hazardous constituents of the waste stream.

Process applicability and waste compatibility are important aspects in the selection of solidification technologies. Economic decisions justify waste solidification only when hazardous wastes are produced in large volumes. Waste compatibility problems arise with application of these technologies. The ideal process renders the hazardous constituents of a waste chemically non-hazardous, containment operations are not necessary.

A major stumbling block with solidification, is the general lack of publically accepted testing methods to determine its suitability and long term stability. For incineration, one must go through a rigorous "test burn" sequence. No such sequence exists for solidification. Furthermore, while there has been some accellerated environmental testing performed on solidification products in Europe, vendors using solidification here have generally resisted using these techniques.

Table 6 denotes some generic categories for solidification options.

TABLE 6.

Generic Categories for Solidification Processes

Silica-cement	Ceramic
Lime-base	Glassification
Thermoplastic	Encapsulation
Organic polymer	

UTLIMATE DISPOSAL

Ultimate disposal options are designed to provide a final repository for hazardous waste streams. These disposal options do not destroy contaminants but are designed to ensure that the contaminants are contained for an indefinite period of time. Ultimate disposal represents a waste management option that has application to waste streams not amenable to other reuse/recovery or treatment processes or to the residuals from treatment, thermal processing, and solidification operations. Ultimate disposal will probably be a part of any waste management plan, since most waste treatment processes produce a waste residual stream that must be handled and disposed. Various ultimate disposal options may be found in Table 7.

TABLE 7.

Various Ultimate Disposal Options

Secure landfill	Seabed implacement
Engineered landfill	Above-ground storage
Structural landfill	Co-disposal
Deep well injection	Lagoons and impoundments
Ocean disposal	Land farming
Geologic isolation	Outer space shipment

CONCLUSIONS

It is difficult to provide a cogent, yet brief, overview of a topic so broad as this one. The framework provided should help to organize the information for an evaluation of available generic processes given a specific set of waste types. This approach is taken from the exemplary efforts of the Minnesota Waste Management Board and the Ontario Waste Management Corporation. Hopefully, it will be of use to others trying to plan for proper management of hazardous wastes.

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ATTACHMENT C

OPERATION AND MAINTENANCE PLANS FOR
HAZARDOUS WASTE TECHNOLOGIES

29th ONTARIO INDUSTRIAL WASTE CONFERENCE

Toronto, Ontario
June 13-16, 1982

PREPARATION OF OPERATION AND MAINTENANCE PLANS FOR FACILITIES THAT GENERATE, STORE, TREAT AND DISPOSE OF HAZARDOUS WASTES

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INTRODUCTION

It has been often stated that any process which is utilized to treat and/or dispose of hazardous waste is only as good as the manner in which it is operated and maintained. Even in the generation, handling, and collection of these wastes in the generator's plant, certain operating plans serve to organize the company's efforts to better manage these wastes and prevent problems from occurring.

In the United States, formal operating plans are required by the Resource Conservation and Recovery Act for any company that treats, stores, or disposes of hazardous wastes. A variety of other hazardous materials regulations also have certain requirements for formalized plans. Compliance with the regulations place great economic and operational demands on these companies - complete with potential enforcement penalties and intense public scrutiny. Regulations also exert considerable pressure on individual managers and corporations to develop new and effective approaches, management practices, policies and procedures, plans, commercial practices, and employee training.

Many companies now are beginning to realize the benefits which accrue from having these plans in their own operation. These benefits include:

- improved safety records with insurance savings and increased employee morale.
- company public image protection.
- avoidance of citations, penalties, and mediation costs.
- minimize costs of regulatory compliance.

From a risk avoidance point of view, these plans should help the company with early minimization of liability including environmental damage or injury to human health. They also provide early maximization of control of liability.

The purpose of this paper is to briefly show what plans should be considered for a facility and what their major components should be. No attempt has been made here to cover every possible item or to be specific to United States regulations. A common sense approach to the development and use of these plans should always be the rule.

WASTE ANALYSIS PLAN

Facilities which generate or manage hazardous wastes need to know certain information about these materials in order to handle them safely and to comply with regulatory reporting requirements. A waste analysis plan which is appropriate to the waste that is handled and the type of facility should be prepared and followed. Without such a plan, many waste generators know very little about their waste properties. Careful watch should be maintained for changes in the process or operation generating the waste to see if its properties or characteristics are altered.

The waste analysis plan describes the parameters for which each waste type will be analyzed. Also included should be the specific analytical procedures used, sampling method to insure representative samples, and the testing frequency. If the waste management facility is removed from the waste generation location (i.e., off-site), specific procedures should be used to insure that the wastes received at the facility match the wastes designated on the manifest (i.e., waybill) and match the wastes for which the facility is capable or approved to manage. Some level of creativity can be used by a skillful analytical chemist to minimize the costs while maximizing the benefits of such a program. This particular plan provides the facility with much information on the manner in which it should operate and the strictness of the items in the plans described below. It is also the plan which is most frequently disregarded when establishing and implementing operation and maintenance procedures.

SECURITY PLAN

Facilities generating or managing hazardous wastes should have a written plan to prevent unknowing entry of people and minimize the potential for unauthorized entry of people or animals onto the active portions of the facility. This can be accomplished by a number of means including: a 24-hour surveillance system, an artificial or natural barrier surrounding the facility, or other means of controlled entry to the area. In all cases, signs with a legend such as "Danger - Unauthorized Personnel Keep Out" should be utilized. The signs should be in the predominant languages and posted to be seen from any approach and legible from a suitable distance (e.g., 25 feet in the United States).

As with other plans, the security plan should be in writing and must be kept current with changes in the facility. Other plans such as the inspection plan are designed to make certain that the components of this plan are intact over time.

GENERAL INSPECTION PLAN

It is most important that the facility be inspected for malfunctions and deterioration, operator errors, and damages which may be causing or lead to the release of hazardous waste constituents to the environment. A written inspection plan must be developed and followed on a fixed schedule. This will be based on a facility's critical processes, equipment, and structures and on the potential for failure and the rate of any deterioration processes (e.g., corrosion, erosion, etc.) which may lead to failure. The plan must contain provisions to remedy any defects noted in the inspections. These inspections must be conducted often enough to identify potential problems in time to correct them before they can create problems. The plan should identify the specific types of problems which should be looked for (e.g., inoperative sump pump, leaking fitting, eroding dike, etc.). A record should be kept of all inspections including when made, who made it, and note when repairs were made. A simple log book can be used for this record. Security personnel can be trained to make many of the more frequent inspection items.

Inspection plans provide some incidental benefits to the facility. The records will assist management in auditing the reliability of certain equipment, the efficiency of maintenance activities, and the effectiveness of the inspection schedule. All of these items are important in risk and loss avoidance programs. Should an incident actually occur, records will help to reconstruct the events that led up to it and may also provide a valuable resource for any emergency decisions that may be required.

Because of the importance of this plan to a facility, some further examples of what could be included are provided below:

- storage areas - look for rust, corrosion, cracks, missing or improper labels, spills.
- dikes - look for damage, structural weakening, examine drainage system for stoppage.
- operating and monitoring equipment - check for normal operations and readings.
- safety and emergency response equipment - check that it meets requirements.
- security devices - check for damages.
- vegetation on and around facility - check for damage.
- active portion of facility - check for fugitive air emissions and odors.
- records - record results of inspection in daily operating record.

Information on the operating record is described later in this paper.

PREPAREDNESS AND PREVENTION PLAN

When dealing with hazardous wastes, facilities should be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or gradual release of hazardous constituents to the environment. This plan is often included in the contingency plan. However, it is separated here to emphasize its importance in helping to prevent contingencies.

The facility should be equipped with an internal communications system (e.g., alarms, telephones, hand-held two-way radios) capable of providing immediate emergency instructions to facility personnel. Immediate access to this equipment by employees is also important in case they need to summons emergency assistance.

Portable fire extinguishers, fire control equipment, spill control and decontamination equipment, water at adequate volume and pressure, foam producing equipment, and automatic sprinklers should be provided if necessary with proper testing, inspection, and maintenance to assure it will work properly in time of

emergency. Aisle space in the facility must remain unobstructed to allow for movement of personnel, fire protection equipment, spill control and decontamination equipment to any area during an emergency.

Prior arrangements should be planned to familiarize police, fire departments, and emergency response teams with the layout of the facility, properties of the hazardous waste handled at the facility and any special associated hazards posed by the operation.

The planning should invovle the formulation of any conceivable scenarios which would lead to the need for contingency and emergency actions followed by a description of what should be done. These items are discussed further in the plan below.

CONTINGENCY AND EMERGENCY RESPONSE PLAN

A contingency plan for a hazardous waste generator or management facility must be designed in an effort to minimize hazards to human health and the environment in the event of fire, explosion, or any accidental release of hazardous waste to the air, soil, or surface water. This contingency plan should include the following information:

- the responsibilities of the facility's emergency coordinators.
- definitions of what constitutes an emergency and a description of the planned response to any emergencies at the facility.
- a list of the facility's emergency coordinators.
- an evacuation plan.

This plan should be kept up-to-date with amendments and revisions made when potential for discharge of hazardous waste change due to change in facility design, construction, or maintenance. Other reasons for change include: changes in emergency personnel or equipment or post-incident studies which recommend changes.

The emergency coordinator designation is a most important element in the plan. A coordinator must be present whenever the facility is in operation. This person must be familiar with the operation and must be specifically listed with name and address in the plan. Among the duties of the emergency coordinator are the following:

- activate on-scene alarms.
- notify appropriate emergency agencies as necessary.

- notify local authorities if evacuation of local areas seems necesary.

- in case of discharge, identify the discharged material as to quantity, character, source, and extent by using records, manifests, and chemical analysis, as appropriate.

- cooperate with authorities.

- provide for disposition of recovered wastes, contaminated soil or material resulting from the emergency.

- insure no waste incompatible with the released material is handled until the emergency is over.

- subsequent to shutdown, check pipelines and other equipment for leaks, pressure buildup, rupture, etc.

- insure all emergency equipment is restored to preincident condition.

Other duties are assigned to this individual as appropriate.

An evacuation plan should be incorporated into this document. It should outline likely evacuation routes together with alternate routes. Also included should be the signal which will be used to mark the beginning of the evacuation.

Local fire and police departments, hospitals, ambulance services, government officials, and the facility's emergency coordinators and staff should all have copies of the contingency plan for reference in case of any emergency. This plan will offer each agency:

- a full understanding of the emergency response program.

- the understanding of their role in the program.

- detailed information regarding the facility and its emergency response capabilities.

- assistance in the training of individual agencies' personnel in terms of studying the layout of specific facilities and determining special requirements needed (e.g., chemical spill/fire handling, special equipment handling, etc.).

PERSONNEL TRAINING PLAN

The purpose of this plan is to reduce the potential for mistakes which might threaten human health or the environment by ensuring that facility personnel acquire expertise in the areas to which they are assigned. In order to function properly, personnel who work at hazardous waste management facilities or who drive equipment destined for such facilities, must successfully complete a program of classroom instruction or on-the-job training. This program should be directed by a person suitably trained in hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed.

At a minimum, the training program is designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment and emergency systems. Where applicable, the following items are included:

- procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment.
- key parameters for automatic feed cut-off systems.
- communications or alarm systems.
- response to fires or explosions.
- response to groundwater contamination incidents.
- shutdown of operations.

Ideally, the training program is extended to include both preparedness and prevention planning considerations to keep emergencies from happening.

Another aspect of the training plan requires the facility operator to provide each employee who works with hazardous waste a job title and a written job description. Records must be kept with this information and documentation of the training received by each individual. Employees must not work in unsupervised positions until they have completed their training program. All facility personnel must take part in an annual review of their training. Records must be kept for these updates or whenever a person is given a new position at the facility which requires modification in the training needs. Training records on current personnel should be kept until closure of the facility. Training records for former employees need to be retained for at least three years from the employee's termination date.

The training plan is broken down by facility components. Each component, while retaining many similar training program elements, has its own unique considerations. Because many employees will work within a limited number of facility components, training needs are assessed and implemented in this manner.

RECORDKEEPING PLAN

Various regulations and the spector of liability claims make it imperative that a plan be written to designate which records should be maintained and how long they should be retained. Manifest documents must be properly filled out and tracked. A program to retain them for three or more years is advisable. Training records generated from the plan described above must also be kept.

One of the most important parts of this plan is a written operating record. This record should contain the following:

- a description and quantity of hazardous waste generated/received.
- method of treatment, storage, or disposal.
- location and quantity of each hazardous waste.
- records and results of waste analysis.
- summary reports.
- details of all incidents that required implementing the contingency plan.
- records and results of inspections.
- any monitoring, testing, or analytical data should also be included in the operating record.

Recordkeeping formats should be simple and compact to insure that they will be utilized effectively and can be stored for the period required.

GROUNDWATER AND LEACHATE MONITORING PLAN

Facilities which have landfills or surface impoundments must have a groundwater and leachate monitoring plan. It is also available for facilities which have a high susceptibility to spillage or runoff from piles. This plan must be capable of determining the impact on the quality of groundwater in the uppermost aquifer underlying the facility.

The plan should specify the groundwater monitoring system specifications including the number and location of the wells together with details on well construction. Attention must be given to the determination of background (upgradient) water quality conditions.

When applicable, leachate monitoring should be conducted in the zone of aeration immediately beneath the facility and above the top of the water table. This will provide an early warning system.

A sampling and analysis program should be designated which identifies sampling frequency, collection method, preservation and shipment of samples, chain-of-custody procedures, minimum parameters and analytical methods to be utilized, and the level of recordkeeping required.

Facilities should seek the services of a competent hydrogeologist and environmental analytical chemist to help with the formulation of this important plan. Reliance on well drillers and plant chemists may lead to problems in the implementation and defensibility of this plan.

CLOSURE AND POSTCLOSURE CARE PLAN

A closure plan describes how the facility will be closed; a description of possible uses after closure; and the anticipated time before the close-out, estimated time for closure and anticipated partial closures. In all cases, proper closure should minimize the need for further maintenance and controls. Closure must be completed within a specified time period after activity stoppage. All equipment should be disposed or decontaminated. The facility should be secured during closure to insure that humans and animals cannot come in contact with hazardous wastes and so discharges cannot occur. Even before closure is anticipated, a cost estimate should be prepared and assurance of closure should be provided. In every case, certification by a knowledgeable registered engineer should be obtained that the facility has been properly closed.

Postclosure care is required when wastes remain on the site after closure. A program for monitoring and reporting must be established. Maintenance of security and containment devices must be provided. If ownership is transferred, the new owners must comply with the plan. As in the case of the closure plan, the facility must assure that it can bear these costs.

WESTON

ATTACHMENT D

EUROPEAN HAZARDOUS WASTE MANAGMENT PRACTICES
AS THEY RELATE TO THE DEVELOPMENT OF
NEW FACILITIES IN THE UNITED STATES

GENERAL IMPRESSIONS

- The level of treatment and protection of the environment is directly proportional to existing hazardous waste regulations and their enforcement. England and France emphasize landfilling, with England having about the weakest regulations in Europe. The Federal Republic of Germany seems to have the most stringent regulations. The Netherlands have recent legislation banning landfill altogether.

- Most central hazardous waste treatment plants are located in an industrial park or area, even though they may border on one side by open space. Most mayors and public officials underestimated the average daily truck traffic to the facility, when asked by the touring group.

- Industry in Europe tends to be quite involved with the hazardous waste management facilities and, in many cases, they are stockholders. It was often stated to the tour group that, "waste generators and off-site waste managers must <u>trust</u> one another for the system to work". Many facilities also work closely with the communities or local chambers of commerce, especially in the area of waste collection system components.

- Experience in handling, blending, and feeding waste to waste management equipment is the most important key to successful operation. Many facilities had bad problems going through the start-up phase of their operation.

- Most waste disposers do <u>not</u> do much research and development. They seem to have their problems meeting regulations, mitigating impacts, and dealing with touring groups and citizens on a day-to-day basis. There were some minor exceptions to this rule.

- Private enterprise sites are not as clean and impressive looking as the public sites. They appear very much like their counterparts here in the United States. However, these facilities tend to be much more flexible and able to cope with waste composition changes and problems at the site.

WESTON

- Excess capacity is a well known feature of hazardous waste management in Europe. Generally, a plant must be of a certain size to have potential commercial liability and there must be at least sufficient waste produced in that area to provide an adequate degree of plant utilization. In Europe, the excess capacity appears to be caused as a result of inadequate planning, pressures from the major waste generators, and, especially, the anxiety of authorities wishing to create higher capacities.

- Private enterprise tends to specialize in landfill and liquid injection incineration, which is much less expensive than the sophisticated rotary kilns usually found only at public, monopolistic facilities. Rotary kilns are generally too capital-intensive. They tend to be built with public funds or receive interest free loans.

- Central facilities tend to get more and more difficult waste to handle. The "cream" of the waste is handled on-site or goes to small specialty operations for recovery and/or reuse thus destroying the mix or balance which is often disruptive for the non-flexible monopolistic facilities.

- Very little recycling is done by central facilities. The major problem is the secondary market requirements. Central plants are not always located to serve this well. Most plants have the attitude that they will treat and dispose of hazardous waste first, then they will worry about recovery.

- Large hazardous waste generators can and will treat their own wastes on-site. There are many fine examples of this in Europe.

- In monopolistic facilities there tends to be poor separation between regulators and facilities.

- There is a tremendous controversy over the use of solidification, except in countries which promote the use of landfilling. Industry wants solidification because it is cheaper than other treatment options, especially when secure landfilling space is not required for the "detoxified" end product.

- There are no magic answers to hazardous waste management in Europe, despite the popular mystique often attributed to facilities there. There is valuable handling and operational experience available in Europe and the United States which is applicable to and should be studied by groups responsible for developing or reviewing facility development projects here in the United States.

Mr. GORE. Thank you very much.

I am going to ask the indulgence of the other three witnesses on this panel. Because Mr. Pojasek is going to have to catch a plane in Memphis, we are going to direct a few questions to him before going to the other members of the panel.

And I will recognize Congressman Durbin.

Mr. DURBIN. Thank you. You may or may not have heard the testimony from the first panel this morning, Mr. Hirschhorn. Did you?

Mr. POJASEK. Yes.

Mr. DURBIN. There was a statement made that at the present time there is available technology, alternate technology, to landfill, which may even be cheaper for some facilities to use. Do I take it from your testimony that you would agree with that remark?

Mr. POJASEK. Yes, I do agree with that remark. There is a large number of facilities in the United States and it may be almost every facility in the United States that does do treatment. I don't know if that is too categorical, but I think that may be the case, that does have at least some available capacity. And many of those facilities are operating a good deal under where they would like to be operating at the present time.

Mr. DURBIN. Is it economical in today's context where at least we are still coming to realize the real cost of landfill? Is it still economical for a company to consider some of these alternative technologies?

Mr. POJASEK. It is very difficult for a company that is facing recession, and again, it is close to the margin or slightly below the margin, to justify, in its own mind, and pay the extra cost for the treatment. I think they are really concerned about their survival at the present time. And I think the companies that are operating closer to the margin will, in fact, use the facility even though the cost is slightly greater. The cost of landfilling has gone up quite a bit in the last few years.

Mr. DURBIN. Do we need to create some incentives perhaps for these businesses to move in the right direction, either punitive or carry a yardstick, as you might say?

Mr. POJASEK. I would say that some types of incentive system such as a fee on the waste generated instead of the feedstock is an excellent idea, and it is probably one that a lot of companies will not argue with, especially the companies that do have large programs to reduce the amount of hazardous waste that they now generate. I would say that would be an excellent incentive.

Mr. DURBIN. In Europe, did you find most of the alternative technology treatment facilities separate and apart from manufacturing plants? Is it a separate business?

Mr. POJASEK. The large companies in Europe do their own waste treatment on site. This Bayer Chemical Plant, I believe, employs about 50,000 people at its plant, plus there are a couple other plants right there. This is just one of their facilities. And they have their own waste treatment right there on site. BASF and a number of other companies in Europe also have very large treatment complexes on site.

When they do go off site, though, in many cases they do become stockholders in the waste treatment business.

I think one of the important things you see in Europe which you don't see as much of in the United States is there is much more trust between the waste generators and the waste management facility, even in some case some financial interest to reinsure that trust.

Where that comes to be a problem that we have seen here in the United States is a particular company, a waste management firm, may handle a particular company's waste for, say, 10 years, or 5 years and it has always been the same. All the time it comes with in the same characteristic.

However, just one time a bad batch came in, the process didn't work, and they dumped part of the reactants in with the waste. And what happened, if there isn't a good waste checking done, that may cause problems.

And I think you may know that there was a large explosion and fire at a facility in New Jersey that was doing solvent recycling. And it was attributed to exactly that. A company that had been recycling their solvent with them for years, sent in a waste that had a little bit too much nitrocellulose in it, which is explosive when it gets up to a certain temperature. They did not bother to tell the recycling facility that this waste was different than the normal waste they submitted in, and in fact it reached its autoignition point and exploded and blew up the still. So this type of relationship between the generator and industry is very, very important. I know that many firms try to foster that here in the United States.

Mr. Durbin. I take it from your testimony that they don't use a fee mechanism, but rather the close cooperation of Government and business to determine the cycle that will be played out from the generation of waste to its management.

Mr. Pojasek. I would say that is most often the case. It is just worked out more on a Government basis.

But in Great Britain, in England, in fact the particular facilities that are there, they are competing with disposal of liquid hazardous waste in municipal landfills, which are legal. It is going in there legally. You have a waste treatment firm that is competing against that, and you go in and you say, my God, what an awful looking facility this is, and you find out that they are one of the most versatile facilities around and that they keep up with the waste streams.

And they had excellent relationships with their generators. They knew when, in fact, the waste generated was different. They knew that a company was going to phase out a certain waste at a certain period of time. And in the monopolistic facility, the HIM facility in HESSE, which was going for a shakedown when I was there, the main feed line to one rotary kiln had sheared, or broke, the day before I got there. Nobody at the facility asked, why did that line shear? Nobody at the facility asked, what do I do in the meantime? The only thing that was said was: Fix the line, make the system work.

Monopolistic facilities tend to be very rigid and less adaptive to changes in the marketplace because they don't feel they have to be.

In the private facilities over there, their survival depends on their ability to make those changes that the marketplace makes,

because the wastes don't stay the same all the time. That is going to be the same way here in the United States.

Mr. DURBIN. It is amazing to me that this subcommittee has been meeting as long as it has today and we haven't mentioned Japan, which tends to be mentioned every time we get together in discussing anything relating to economy or environment.

Do you have any knowledge of how they handle these problems?

Mr. POJASEK. Yes, sir. The reason people don't go to Japan is because there is a concept here in the United States that everybody thinks that central treatment is the best. We have one stop shopping and have a nice big central treatment facility. Japan doesn't believe in that at all.

Japan has many large companies that have grown in their country. And in fact they have regulations and incentives for handling wastes on site and abating the amount of waste generated. So if one were to conduct a tour looking at centralized treatment facilities and how regulations work on these centralized treatment facilities, one would never want to visit the country of Japan.

I think many people who claim to be doing centralized treatment in Japan, and there are some firms that claim that, when you look at the size of their operations over there, they are extremely small. They hate to tell you the amount of waste they treat except that they have a centralized plant over there.

So I think if you are interested in how waste can be abated and how large companies can handle wastes on site, Japan is the place to go.

But, in fact, there are many large companies here in the United States that do handle their own wastes, and you can see the same examples of that technology both here and in Europe without going to Japan.

Mr. DURBIN. Thank you very much.

Mr. GORE. Well actually we seem to be handling most of our waste on site, as well. The difference is we are not treating it, we are just storing it.

And I was informed during the lunch break by someone from the State that apparently most of the waste disposed of on site here in Tennessee is not land-filled, but just is stored above ground.

Mr. POJASEK. It is an interesting regulation in West Germany which says that you only need a permit for treatment of waste when the waste leaves the site of generation. And if you do treatment on site, you do not need a permit for that treatment, except as if you are going to discharge something, either put it in the ground or discharge some waste water that has been cleaned up. What this has put forth is an industry of mobile waste treatment technology. They are very, very nifty, and a lot of them just have to do with the quick treatment and settling out of solids. Because, again, they can't put liquids in landfills anyway. So they allow firms to store, up to a certain quantity. This tractor-trailer mounted unit comes on, does the filtering, discharges the liquid to the sewer system with a permit, and that discharge is monitored by the regulatory officials. Then they take the solids off the premises and bring that either for treatment if it is hazardous or to landfilling if it is hazardous. And what this does is, it cuts down dramatically on the number of trucks that are on the road with some type of waste,

and it also allows the landfills to accept much less materials. They are not taking any liquids.

Mr. GORE. OK. Let me run through a couple things with you real quickly, and we will move onto the rest of the panel.

I am looking at your testimony, and I am trying to get a clear understanding of it in my own mind. You are really telling us that there are several things which could and should be done in order to speed up the availability of alternative disposal technology. That is really the thrust of your testimony?

Mr. POJASEK. Yes.

Mr. GORE. Now, you are saying, No. 1, you ought to start with a pretty good survey of the kinds of wastes that are being generated in a given State, and the wastes ought to be classified according to their physical and chemical properties. Right?

Mr. POJASEK. That is correct.

Mr. GORE. Second, you are saying, there ought to be a forecasting model, which will enable you to predict fluctuations in the quantities generated in each of those categories.

Mr. POJASEK. That is correct.

Mr. GORE. OK. Third, you are saying there ought to be an inventory made of the generic disposal technologies that are available, so that you can match the predictable quantities of waste by category with the available technologies that are available from companies that want to submit to bids.

Fourth, you are saying—you are shifting gears and addressing the environment in which this match takes place between waste and disposal technologies. You are saying we simply have to recognize, as a country, that there are economic distortions and disincentives which impede the sensible matching of appropriate disposal technologies with different categories of wastes, and we need to change those distortions of the marketplace.

Next, you are saying that those who wish to take responsibility for disposing of waste properly must accept the heavy obligation of convincing the public that they can, in fact, do a good job and handle the waste safely and responsibly.

And finally, you say there does need to be some more research and development. Even though the technology is available today, a lot of new ideas are becoming available everyday and we have to pay attention to them and make certain that they get into the marketplace as quickly as they become available. Is that a fair summary of what you are trying to tell us?

Mr. POJASEK. Yes, sir.

Mr. GORE. All right. If I were to ask you to rank the different alternative technologies, I suppose you would tell me that it would depend upon the kinds of waste involved; is that right?

Mr. POJASEK. Yes, it would. And it would also go back to that hierarchy that was spoken to this morning. In one of the papers I presented, the American Institute of Chemical Engineers paper that is in your packet, does address the same hierarchy. I think the public wants you to be up at the abatement, reduction, recycle, reuse and they don't want you to be down at the disposal. But you have to realize that in the hierarchy both of those things have to be and are used. But the position in the hierarchy is determined generally by economics.

Mr. GORE. And economics are determined by whether it pays or not to act responsibly.

Mr. POJASEK. That is correct.

Mr. GORE. And currently, a company that wants to act irresponsibly and dump with the cheapest technology available is often rewarded.

Mr. POJASEK. Well, the thing is that, again, any company, unfortunately, the way our free enterprise system is set up, is that just about any company wants to conform to the regulation, but will conform to existing regulation in the most cost effective manner possible. So if you have the regulations allowing the cheap landfilling without pretreatment of the waste before they go in, they are following the system.

But, yes, they are opening themselves to some cost further down the line, possibly.

Mr. GORE. OK. I think you have made a real contribution here, and I really appreciate the better understanding that you have given me and the subcommittee. And I know that you have to make that airplane and we are running a little bit overtime, so please feel free to go ahead and catch your plane.

I appreciate the indulgence of the other three witnesses on this panel very much. We will proceed now with Doug Ezell, plant manager of Systech Waste Treatment Corp. in Antioch, Tenn., representing the National Solid Waste Management Association.

Mr. Ezell, welcome.

Mr. EZELL. Thank you, Mr. Chairman, and members of the committee. I am Doug Ezell, plant manager of SLTC. We have a regional pretreatment center for the management of hazardous liquid waste in Antioch, Tenn. SLTC is a subsidiary of Tricil, Ltd., a waste service company headquartered in Canada with operations in the United States.

I am appearing here today on behalf of the National Solid Waste Management Association and its Institute of Chemical Waste Management. The Institute of Chemical Waste Management is composed of firms which own and/or operate hazardous waste storage treatment or disposal facilities. The institute was formed to promote the proper treatment, processing, transportation, and disposal of chemical and other waste materials believed to be hazardous to human health and environment.

NSWMA was instrumental in congressional enactment of the Resource Conservation and Recovery Act in 1976 and has been a steady supporter of strong standards, strict enforcement and accelerated permitting under RCRA. The institute firmly supports the mandate of RCRA that all hazardous waste be treated and/or disposed of using the technology which meets a strict standard of protection for human health and the environment.

This is the proper standard, protection of public health and the environment, a stronger standard than that in other Federal environmental statutes. It does not favor one technology over another, but rather imposes a high performance standard and applies it to all technologies. We are here today to share our experience with the various alternate technologies for the proper management of hazardous waste. We support all alternate technologies necessary to reach and maintain the goal of protection as mandated in

RCRA. We insist that only technologies which can satisfy the strict RCRA standards be allowed to be used to manage waste.

Because of the extensive experience of NSWMA member companies, the institute believes that proper and safe handling of industrial waste requires a combination of technologies suitably matched to the enormous variety of hazardous and industrial waste streams. A multitechnology approach is required because wastes differ in composition, both physically and chemically. Even the same waste streams from similar industries may differ greatly, depending upon the generator. Operators of hazardous waste management facilities must match the characteristics of the wastes with the most appropriate treatment and/or disposal process evaluating the volume of waste, the cost of the process, the ease of treatment, and the available supplies and capacity.

In no case should the operator have the option of using a technology which cannot safely manage any particular waste stream. Following treatment or processing, all technologies except the most esoteric will also require an ultimate disposal for the residue. In short, almost every treatment and processing facility requires landfilling for its residue.

This is true of older technologies like incineration and solidification and more physical chemical treatment of processes. One of the prime objectives of RCRA as well, is to encourage waste reduction and recycling. Of course, the higher cost of satisfying more rigid environmental standards encourages waste reduction. Other regulatory initiatives such as prohibiting the land disposal of certain wastes which cannot be safely accommodated in the land, promote waste reduction, recycling and alternate technologies.

What I would like to point out is the necessary link between recycling and land disposal, a link which is essential for you to understand in evaluating the proper role for land disposal in our national management waste strategy.

For example, one NSWMA member is in the business of reprocessing waste oil into a high quality lubricating oil using an acid clay process. For every 100 gallons of waste oil, he is able to salvage 83 gallons of high quality lube oil, the remaining 17 gallons become an acid/clay metal sludge that must be land disposed. Unless this operator has a conveniently available and reasonably priced land disposal facility, the economics of this recycling process are completely blown, and all the 100 gallons of waste oil will remain a waste. I hope you see that these waste management so-called alternatives are really complimentary processes in an integrated system.

Let me illustrate. SLTC regional pretreatment center treats acids, caustics, oil/water coolants, plating wastes and other industrial liquid wastes on a case-by-case basis. The SLTC process renders these wastes nontoxic, noncorrosive, and otherwise nonhazardous. We analyze the conditioned wastes to insure that it is nonhazardous. Then we dewater the waste to generate a readily manageable solid residue, which is fully compatible—I am sorry, readily manageable solid residue and wastewater which is fully compatible with the Metropolitan Nashville waste water treatment system. The volume has then been reduced by 88 percent. The U.S. EPA

and the State of Tennessee have both recognized the nonhazardous nature of the residue, and EPA has delisted the residue.

By virtue of our waste treatment technology, we are able to dispose of the delisted residue in the most economically and environmentally sound manner possible at the local sanitary landfill. The net effect of this waste management system is a significant reducton of volume of waste disposed in the land and maximized protection of the environment. I would add that there are other forms of treatment which render waste nonhazardous or less hazardous, but actually increase the volume of the treated waste.

Let me give you another example of an alternate technology used by our company to reduce the volume of waste for disposal. Our parent company, Tricil, incinerates millions of gallons of combustible industrial waste and achieves nearly 99 percent reduction of volume for ultimate disposal of the ash in secure landfills. All incinerators, of course, must have a secure landfill for the residues.

There are a number of other alternate technologies employed by other firms for the safe management of hazardous waste. For some waste, encapsulation is the preferred technology. In this case, liquid or solid wastes are encapsulated in Portland or bituminous cement or other bonding conglomerates effectively isolating the waste material from the environment. Other alternatives include removal of toxic constituents of wastes by carbon absorption, ion exchange, reverse osmosis or other technologies followed by secure landfilling.

Concentrated toxics can be destroyed to affect the detoxification by biological treatment, chemical or wet-air oxidation, or pyrolysis. All of these technologies when applied to the right waste streams lead to ultimate and proper management of wastes.

In summary, the waste service industry utilizes technologies which assure minimization of disposal requirements, detoxification, and treatment to otherwise render waste nonhazardous where possible and thus provide protection for human health and the environment.

Thank you.

The prepared statement of Mr. Ezell follows:]

Testimony Presented before
Subcommittee on Investigations and Oversight
House Committee on Science and Technology

March 30, 1983

Jackson, Tennessee

By Mr. Doug Ezell for the National Solid Waste Management Association

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Alternative Technologies Panel

Mr. Chairman and members of the Committee, I am Doug Ezell, Regional Operations Manager for SLTC. We have a regional pretreatment center for the management of hazardous liquid waste in Antioch, Tennessee. SLTC is a subsidiary of TRICIL, Ltd., a waste service company headquartered in Canada with operations in the United States. I am appearing today on behalf of the National Solid Wastes Management Association (NSWMA) and its institute of Chemical Waste Management. The Institute of Chemical Waste Management is composed of firms which own and/or operate hazardous waste storage treatment or disposal facilities. The institute was formed to promote the proper treatment, processing, transportation and disposal of chemical and other waste materials believed to be hazardous to human health and the environment.

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This is the proper standard - protection of public health and the environment - a stronger standard than that in other federal environmental statutes. It does not favor one technology over another, but rather imposed a high performance standard and applies it to all technologies. We are here today to share our experience with the various alternate technologies for the proper management of hazardous waste. We support all alternate technologies necessary to reach and maintain the goal of protection as mandated in RCRA. We insist that only technologies which can satisfy the strict RCRA standards be allowed to be used to manage waste.

Because of the extensive experience of NSWMA member companies, we believe that proper and safe handling of industrial waste requires a combination of technologies suitably matched to the enormous variety of hazardous and industrial waste streams. A multi-technology approach is required because wastes differ in composition, both physically and chemically. Even the same waste streams from similar industries may differ significantly depending on the generator. Operators of hazardous management facilities must match the characteristics of the wastes with the most appropriate treatment and/or disposal process evaluating the volume of waste, the cost of the process, the

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One of the prime objectives of RCRA is to encourage waste reduction and recycling. Of course, the higher cost of satisfying more rigid environmental standards encourages waste reduction. Other regulatory initiatives such as prohibiting the land disposal of certain wastes which cannot be safely accommodated in the land, promote waste reduction, recycling and alternative technologies.

What I would like to point out is the necessary link between recycling and land disposal, a link which is essential for you to understand in evaluating the proper role for land disposal in our national waste management strategy.

For example, one NSWMA member is in the business of reprocessing waste oil into high quality lubricating oil using an acid clay process. For every 100 gallons of waste oil he is able to salvage 83 gallons of high quality lube oil, the remaining 17 gallons become an acid/clay/metal sludge that must be land disposed. Unless this operator has a conveniently available and reasonably priced land disposal facility. There maybe no economic incentive for recycling the 100 gallons of waste oil and it will remain a waste. I hope you see how these waste management so called "alternatives" are really mutually inclusive processes within a total integrated waste management system.

Let me illustrate. In our regional pretreatment center we treat waste acids, caustics, oil/water coolants, plating wastes and other industrial liquid wastes on a case-by-case basis. The SLTC process renders these wastes non-toxic, non-corrosive, and otherwise non-hazardous. We analyze the conditioned wastes to insure that it is non-hazardous. Then, we dewater the waste to generate a readily manageable solid residue and wastewater which is fully compatible with the Metropolitan Nashville wastewater treatment system. The U.S. EPA and the State of Tennessee have both recognized the non-hazardous nature of the residue and have delisted the residue.

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In summary, the waste service industry supports the utilization of technologies which assure minimization of disposal requirements, detoxification and treatment to otherwise render waste non-hazardous where possible and thus provide protection for human health and the environment.

Thank you.

Mr. GORE. Thank you very much.

Our next witness is Charles Robertson from Ensco, Inc. in Little Rock, Ark., representing the Hazardous Waste Treatment Council.

We are delighted to have you, Mr. Robertson. Please proceed.

Mr. ROBERTSON. Thank you, Congressman Gore.

I am president of the Hazardous Waste Treatment Council, and I am here today on behalf of the Hazardous Waste Treatment Council.

We are a national association of companies engaged in a wide variety of high technology treatment of hazardous wastes. I appreciate the opportunity to testify before the committee.

Mr. Chairman, only through the treatment and resulting destruction of hazardous waste can human health and environment be protected for this generation and generations to come. To minimize the needs of treatment, generated hazardous wastes should be reduced by volume and toxicity, and recovery and recycling. Together, such a national strategy should minimize the need for land disposal of hazardous waste. Our society is not likely to eliminate entirely, however, returning certain wastes to the land from which they came. Land disposal can be allowed, as recommended by the Office of Technology Assessment, for suitable wastes, such as residuals from waste treatment operations, pretreated or stabilized wastes, untreatable wastes, and relatively low hazard and other high volume wastes. But land disposal of hazardous waste clearly is the management practice of last resort.

Treatment of hazardous waste includes a wide variety of alternative management technologies.

One set of technologies includes reuse, recycling, and recovery of materials of commercial value, either in whole or in part, from waste materials so as to reduce or to eliminate the amount of material which has to be placed, ultimately, back into the environment.

After generator waste reduction activities, this is the most preferred treatment technology. It minimizes environmental risk and can reduce management costs or sometimes even make money. But in spite of its desirability, it is the most difficult technology to prac-

tice. This is because it requires mixing and matching the waste disposal market and the market for raw materials. In this example, the waste is used as a substitute raw material, or as a feedstock for producing a product.

Another category is detoxification. Simply stated, detoxification is a conversion of a hazardous waste to a nonhazardous waste. It includes incineration, and a variety of chemical, biological and physical processes. These destroy or remove the truly toxic portion of the wastes, or condenses it into a small volume, resulting in the bulk of the waste being something that can be discharged into the environment or to another treatment process.

If you can't recover the hazardous constituents or detoxify them, then the only other management option is to secure storage or containment. On the management hierarchy, this is the least desirable and therefore should be the technology of last resort. Unfortunately, this is the most prevalent practice today.

The treatment of hazardous waste is technically feasible, available, and unquestionably environmentally preferable to land disposal.

EPA has even acknowledged that its land disposal standards are not sufficient to prevent or adequately reduce the potential adverse human health and environmental impacts posed by the land disposal of hazardous wastes. California in 1981, estimated that 75 percent of the hazardous waste landfill could have been recycled, treated, or destroyed, with only a minimal effect on industry.

The National Research Council of the National Academy of Sciences recently concluded that, disregarding costs, technology exists now to treat any hazardous waste. An EPA contractor found our industry has significant unused treatment capacity. Our members report a raining of 30 to 50 percent of unused capacity in 1982.

So why is 80 percent of the hazardous waste generated each year put into the ground? Why do generators manage their wastes with hopes that it will be confined in a landfill with the almost assured knowledge that it won't?

Simply put, the generator of hazardous waste has unfettered discretion in choosing how to manage its wastes any way short of "midnight dumping." Too many are able to choose the least expensive, most expedient way to deal with their wastes, and that is land disposal.

Congress must prohibit land disposal of certain hazardous wastes that, regardless of physical state, cannot be contained by landfill. Specific wastes should be prohibited from land disposal by statute. EPA would supplement this statutory list by regulations adding additional hazardous wastes that should not be landfilled.

The Hazardous Waste Treatment Council proposes that certain, already listed hazardous wastes, specifically halogenated solvents and pesticides, metal finishing wastes, and potential dioxin-containing wastes, be banned by Congress from land disposal. Treatment technologies and capacity now exists for these wastes. These hazardous wastes already are regulated. The only question is how they are to be managed. They are toxic, mobile, persistent, and bioaccumulative. Their constituents have been found in too many instances of ground water contamination. They should not, therefore, be allowed to be landfilled.

The Resource Conservation and Recovery Act must be amended to require that a generator utilize the best management practice, that is, best available treatment, for certain specified wastes. The Congress and EPA should not be neutral over whether hazardous wastes will be treated or merely landfilled with hopes of containment. RCRA should be explicitly technology-forcing to encourage, and require where necessary, treatment.

The current loopholes and gaps in RCRA are inhibiting the utilization and development of safe and environmentally sound treatment technologies. More hazardous wastes are unregulated than are regulated by EPA. Land disposal is subject to less stringent and environmentally protective standards than treatment, encouraging short-term generator cost-savings at the expense of long-term, more cost-effective and environmentally protective treatment. Incineration and other treatment methods will continue to be discouraged if EPA allows hazardous wastes to be burned in unpermitted, uncontrolled, and unregulated offsite commercial and residential boilers and in cement kilns; or allows the mixing of hazardous waste with heating oil and sold to unsuspecting customers. This loophole may expose the public to 1.2 million metric tons of hazardous pollutants.

If EPA allows small quantity generators to dispose of 12 tons of hazardous wastes per generator per year in sanitary landfills, without notification to transporters or disposal facilities, and without any applicable management standards; and if EPA allows less costly land disposal under inadequate regulations that exempt "existing portions" of landfills from design and operating standards; exempt double-lined landfills from ground water monitoring requirements; and fails to establish uniform, objective variance standards.

The members of the Hazardous Waste Treatment Council have invested millions of dollars throughout the country in high technology treatment facilities for hazardous wastes. We have done this without Federal financial subsidy in the past, and do not seek any in the future. We have built and generated hazardous waste treatment facilities in spite of uncertainties over Federal regulation, and in spite of powerful Federal disincentives for generators to treat, rather than landfill, their wastes.

Our industry has supported strong Federal laws, regulations and their enforcement. We operate the most publicly scrutinized, non-Governmental industry. We must therefore do all within our power to convince a skeptical public that they should have confidence that Government controls and our own management practices will be more than adequate to protect human health and the environment. The tragedy of our time is that the public is entirely justified in being skeptical.

The hazadous waste treatment industry cannot be expected to continue to invest in new treatment facilities when Government policy keeps us operating at below capacity. We must question whether the Federal Government really believes that Congress is serious in requiring EPA to regulate "as necessary to protect human health and the environment" when more hazardous wastes are exempted from regulation than are regulated.

We must question whether the EPA really believes that land disposal is the least desirable way to manage hazardous waste when it indirectly subsidizes landfilling and prices us out of the market.

The Resource Conservation and Recovery Act was going to fill in the remaining gap in environmental laws and protect the land and the ground water from hazardous wastes. CERCLA was going to deal with the gap created by past disposal practices and the problems created by hazardous substances threatening the environment that didn't fit into any of Congress or EPA's neat programmatic pigeonholes.

Six years after RCRA, we will have 10 years to go before EPA will regulate all land disposal facilities. Unless Congress acts to close the RCRA loopholes, to reassert its authority over regulatory agencies, to restore public confidence, the environmental gains of the past decade will have been lost, the goals of a decade of environmental protection legislation unrealized. Unless Congress acts, the public will again be confronted with the need for corrective action for past disposal practices. Unless Congress acts, the public will again be confronted with the need for corrective actions for past disposal practice. Unless Congress acts, the public will again be needlessly exposed to uncontrolled releases of hazardous pollutants. We in the hazardous waste treatment industry can only go so far alone. We look to Congress and this subcommittee for the leadership to assure that hazardous wastes are managed in the best possible way, because that is the minimum required to protect human health and the environment.

I thank the committee for the opportunity to be here today.

[The prepared statement of Mr. Robertson follows:]

TESTIMONY OF CHARLES ROBERTSON, PRESIDENT, HAZARDOUS WASTE TREATMENT COUNCIL ON ALTERNATIVE TECHNOLOGIES FOR HAZARDOUS WASTE DISPOSAL

SUMMARY OF STATEMENT BY THE HAZARDOUS WASTE TREATMENT COUNCIL

Mr. Chairman, Members of the Committee, my name is Charles Robertson. I am President of the Hazardous Waste Treatment Council. I am here on behalf of the Hazardous Waste Treatment Council. We are a national association of companies engaged in a wide variety of high technology treatment of hazardous wastes. I appreciate this opportunity to testify before this Committee.

Mr. Chairman, only through the treatment and resulting destruction of hazardous waste can human health and the environment be protected for this generation and generations to come. To minimize even the need for treatment, generated hazardous wastes should be reduced by volume and toxicity, and recovery and recycling. Together, such a national strategy should minimize the need for land disposal of hazardous waste. Our society is not likely to eliminate entirely, however, returning certain wastes to the land from which they came. Land disposal can be allowed, as recommended by the Office of Technology Assessment, for suitable wastes, i.e., residuals from waste treatment operations, pretreated or stablized wastes, untreatable wastes, and relatively low-hazard (and other high volume) wastes. But land disposal of hazardous waste clearly is the management practice of last resort.

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One set of technologies include reuse, recycling, and recovery of materials of commercial value, either in whole or in part, from waste materials so as to reduce or to eliminate the amount of material which has to be placed, ultimately, back into the environment. After generator waste reduction activities, this is the most preferred treatment technology. It minimizes environmental risk and can reduce management costs or sometimes even make money. But in spite of its desirability, it is the most difficult technology to practice. This is because it requires mixing and matching the

waste disposal market and the market for raw materials. In this example, the waste is used as a substitute raw material, or as a feedstock for producing a product.

Another category is detoxification. Simply stated, detoxification is a conversion of hazardous waste to a nonhazardous waste. It includes incineration, and a variety of chemical, biological, and physical processes. These destroy or remove the truly toxic portion of the wastes, or condense it into a small volume, resulting in the bulk of the waste being something that can be discharged into the environment or to another treatment process.

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The Resource Conservation and Recovery Act (RCRA) must be amended to require that a generator utilize the Best Management Practice, i.e., Best Available Treatment, for certain specified wastes. The Congress and EPA should not be neutral over whether hazardous wastes will be treated or merely landfilled with hopes of containment. RCRA should be explicitly technology-forcing to encourage, and require where necessary, treatment.

The current loopholes and gaps in RCRA are inhibiting the utilization and develpment of safe and environmentally sound treatment technologies. More hazardous wastes are unregulated than are regulated by EPA. Land disposal is subject to less stringent and environmentally-protective standands than treatment, encouraging short-term generator cost-savings at the expense of long-term, more cost-effective and environmentally-protective treatment. Incineration and other treatment methods will continue to be discouraged:

If EPA allows hazardous wastes to be burned in unpermitted, uncontrolled and unregulated off-site commercial and residential boilers and in cement kilns; or allows the mixing of hazardous waste with heating oil and sold to unsuspecting customers. This loophole may expose the public to 1.2 million metric tons of hazardous pollutants;

If EPA allows small quantity generators to dispose of 12 tons of hazardous wastes per generator per year in sanitary landfills, without notification to transporters or disposal facilities, and without any applicable management standards; and

If EPA allow less costly land disposal under inadequate regulations that exempt "existng portions" of landfills from design and operation standards; exempt double-lined landfills from groundwater monitoring requirements; and fails to establish uniform, objective variance standards.

The members of the Hazardous Waste Treatment Council have invested millions of dollars throughout the country in high technology treatment facilities for hazardous wastes. We have done this without federal financial subsidy in the past, and do not seek any in the future. We have built and generated hazardous waste treatment facilities in spite of uncertainties over federal regulation, and in spite of powerful federal disincentives for generators to treat, rather than landfill, their wastes.

Our industry has supported strong federal laws, regulations, and their enforcement. We operate the most publicly-scrutinized, non-governmental industry. We must therefore do all within our power to convince a skeptical public that they should have confidence that government controls and our own management practices will be more than adequate to protect human health and the environment. The tragedy of our time is that the public is entirely justified in being skeptical.

The hazardous waste treatment industry cannot be expected to continue to invest in new treatment facilities when government policy keeps us operation at below capacity. We must question whether the federal government really believes that Congress is serious in requiring EPA to regulate "as necessary to protect human health and the environment" when more hazardous wastes are exempted from regulation than are regulated. We must question whether the EPA really believes that land disposal is the least desirable way to manage hazardous waste when it indirectly subsidizes landfilling and prices as out of the market.

The Resource Conservation and Recovery Act was going to fill in the remaining gap in environmental laws and protect the land and the groundwater from hazardous wastes. CERCLA was going to deal with the gap created by past disposal practices and the problems created by hazardous substances threatening the environment that didn't fit into any of Congress' or EPA's neat programmatic pigeonholes.

Six years after ECRA, we still have ten years to go before EPA will regulate all land disposal facilities. Unless Congress acts to close the RCRA loopholes, to reassert its authority over regulatory agencies, to restore public confidence, the environmental gains of the past decade will have been lost, the goals of a decade of environmental protection legislation unrealized. Unless Congress acts, the public will again be confronted with the need for corrective action for past disposal practices. Unless Congress acts the public will again be confronted with the need for corrective action for past disposal practice. Unless Congress acts, the public will again be needlessly exposed to uncontrolled release of hazardous pollutants. We in the hazardous waste treatment industry can only go so far alone. We look to Congress for the leadership to assure that hazardous wastes are managed in the best possible way, because that is the minimum required to protect human health and the environment.

I again thank the Committee for the opportunity to testify on behald of the Hazardous Waste Treatment Council, and welcome any questions.

Mr. Chairman, Members of the Committee, my name is Charles Robertson. I am President of the Hazardous Waste Treatment Council. I am here on behalf of the Hazardous Waste Treatment Council. We are a national association of companies engaged in a wide variety of high technology treatment of hazardous wastes. I appreciate this opportunity to testify before this Committee.

Mr. Chairman, only through the treatment and resulting destruction of hazardous waste can human health and the environment be protected for this generation and generations to come. To minimize even the need for treatment, generated hazardous wastes should be reduced by volume and toxicity, and recovery and recycling. Together, such a national strategy should minimize the need for land disposal of hazardous waste. Our society is not likely to eliminate entirely, however, returning certain wastes to the land from which they came. Land disposal can be allowed, as recommended by the Office of Technology Assessment,[1] for suitable wastes, i.e., residuals from waste treatment operations, pretreated or stabilized wastes, untreatable wastes, and relatively low-hazard (and other high volume) wastes. But land disposal of hazardous waste clearly is the management practice of last resort.

Treatment of hazardous waste includes a wide variety of alternative management technologies.

One set of technologies include reuse, recycling, and recovery of materials of commercial value, either in whole or in part, from waste materials so as to reduce or to eliminate the amount of material which has to be placed, ultimately, back into the environment. After generator waste reduction activities, this is the most preferred treatment technology. It minimizes environmental risk and can reduce management costs or sometimes even make money. But in spite of its desirability, it is the most difficult technology to practice. This is because it requires mixing and matching the

[1] Technology and Management Strategies for Hazardous Waste Control, Congress of the United States, Office of Technology Assessment, Washington, D.C., March 1983.

waste disposal market and the market for raw materials. In this example, the waste is used as a substitute raw material, or as a feedstock for producing a product.

Another category is detoxification. Simply stated, detoxification is a conversion of hazardous waste to a nonhazardous waste. It includes incineration, and a variety of chemical, biological, and physical processes. These destroy or remove the truly toxic portion of the wastes, or condense it into a small volume, resulting in the bulk of the waste being something that can be discharged into the environment or to another treatment process.

If you can't recover the hazardous constituents or detoxify them, then the only other management option is secure storage or containment. On the management hierarchy, this is the least desirable and thereore should be the technology of last resort. Unfortunately, this is the most prevalent practice today.

The treatment of hazardous waste is technically feasible, available, and unquestionably environmentally preferable to land disposal. EPA has even acknowledged that its land disposal standards are not sufficient to prevent or adequately reduce the potential adverse human health and environmental impact posed by the land disposal of hazardous wastes. California, in 1981, estimated that 75 percent of the hazardous waste landfilled could have been recycled, treated or destroyed, with only a minimal effect on industry. The National Research Council of the National Academy of Sciences recently concluded that, disregarding costs, technology exists now to treat any hazardous waste. An EPA contractor found our industry has significant unused treatment capacity. Our members report a range of 30 to 50 percent of unused capacity in 1982.

So why is 80 percent of the hazardous waste generated each year put into the ground? Why do generators manage their wastes with hopes that it will be confined in a landfill with the almost assured knowledge that it won't?

Simply put, a generator of hazardous waste has unfettered discretion in chosing how to manage its wastes any way short of "midnight dumping?" Too many are able to choose the least expensive, most expedient way to deal with their wastes, and that is land disposal.

GOVERNMENT ACTION WILL DETERMINE THE FUTURE OF HAZARDOUS WASTE TREATMENT TECHNOLOGY

RCRA is presently neutral between land disposal and treatment, and thus works against treatment. The major factors for the generator's decision on which management practice to use are cost and a sense of responsibility. Even though the risks from land disposal are greater, the economic incentives favor it. This governmental neutrality can be tolerated no longer.

In the absence of a statutory, technology-based treatment standard, a generator's management decision will continue to be based on short-term economic considerations which are entirely within the letter of the law, but which may be inconsistent with sound, long-term public policy objectives. We feel that Congress and EPA must ensure that long-term public policy objectives are considered and protected in a generator's management decisions.

Hazardous waste treatment facilities are capital intensive and require long lead planning and construction times. We have a greater investment to be recovered, which requires us to place a greater and upfront economic cost on the generator. The generator initially pays more, with society and the generator benefiting in the long-term, because treatment minimizes the risk of future cleanup activities. That's a difficult economic concept to demonstrate on a current year balance sheet. Land disposal minimizes a generator's current costs, but does not eliminate the future cost and need for response and remedial action. These future costs will be spread among other generators and the public at large. Treatment facilities must go through a technologically intensive permitting process that is more intensive—to date—than for land disposal, which further increases the costs of treatment. The "system" clearly discourages a generator from choosing treatment over land disposal.

The recent Report by the Office of Technology Assessment details the short-term cost advantages of land disposal. Land disposal is about four times cheaper than treatment. This is understandable by a specific example from one of our members that recently began operating a commercial hazardous waste incinerator. The initial cost was $22 million, with a permitted annual capacity of 40,000 tons. It took two and a half years to complete the necessary permitting requirements and complete construction. In contrast, a hazardous waste landfill exceeding the requirements of the present RCRA standards can be built for about $8 million, with a capacity to

receive 100,000 tons of waste annually, over a 7 year useful life. It would take about one year to permit and build it.

The obvious cost advantage of the landfill is increased when you factor in the incinerator's greater operating and maintenance requirements, its need for more skilled and more highly paid employees, and its need for more laboratory and maintenance support.

The greater use of treatment will increase industry near-term costs, perhaps by as much as 50–100 percent, according to OTA. The alternative, continual land disposal, may mean that decades from now we may be cleaning up a leaking site that might cost, again according to OTA,"10 to 100 times the additional costs incurred today to prevent releases of hazardous materials."

Hazardous waste treatment companies are in a situation comparable to that of a state that tries to unilaterally establish environmental regulations that are much tougher than other states, in the absence of a minimum, uniform national technological standard. Such a progressive state soon finds itself faced with the threat of loss of industry to those other states with less stringent standards.

Congress must amend RCRA to establish a minimum, national technology-based treatment standard to bring it into line with other, technology-forcing environmental legislation.

The current loopholes and gaps in the RCRA regulations are inhibiting the development of safer and more environmentally sound hazardous waste treatment technology. Incineration and other high technology methods of treating hazardous wastes will continue to be discouraged if the EPA continues its present regulatory programs that:

(1) allow land disposal of certain hazardous wastes that cannot be contained by landfill liner systems, regardless of physical state;

(2) allow one-half of all hazardous wastes generated annually to be blended and to be burned in unpermitted, unregulated, and uncontrolled off-site commercial facilities, residential boilers and unregulated cement kilns, potentially emitting annually 1.2 million pounds of uncontrolled hazardous air pollutants;

(3) allow small quantity generators to dispose of up to one ton a month per generator of their hazardous wastes in sanitary landfills;

(4) allow discharges of five million tons a year of untreated hazardous wastes into publicly owned sewage treatment works (POTWs);

(5) allow wastes that clearly are hazardous to continue to be unregulated because they haveen't been formally "listed" or because EPA hasn't devoted adequate resources to develop the scientific data, or committed enough personnel to move the paperwork to enable it to control these wastes; and

(6) exempts from the admittedly deficient land disposal standards for those "existing portions" of interim status land disposal facilities that were included within the boundaries of the site's Part A application, even though it has never been used and it may take ten years for EPA to require the entire facility to comply with the final permit standards.

Faced with economic and regulatory disincentives to treatment, it is little wonder that generators choose to "manage" their wastes by land disposal, rather than by treatment.

BEST AVAILABLE TREATMENT—A NEW MANAGEMENT STANDARD TO MINIMIZE LAND DISPOSAL

RCRA should be amended to require that certain wastes be subject to a Best Management Practice (BMP) requirement. For these wastes, the generator would be required to utilize the Best Available Treatment, e.g., detoxification, incineration, pretreatment, recycling and recovery, to assure that specified hazardous wastes will be rendered non-hazardous, or be capable of being discharged into the environment wthout threatening human health and the environment.

BMP/Best Available Treatment would not be a static regulatory concept. "Availability" of treatment capacity would include capacity reasonably anticipated to be available in the near future, not just at any one point in time. The objective is to encourage new treatment capacity. It is not a specific treatment technology standard, because the technology for hazardous waste treatment is too varied and dynamic to be locked into a single static technology standard.

Specified wastes must be treated unless a generator can demonstrate, considering technological feasibility, and commercial availability, that it cannot be treated as an alternative to land disposal. Where a waste stream can be treated prior to being land disposed, it should be pretreated.

Congress should specify hazardous wastes that should not be landfilled

The Hazardous Waste Treatment Council concurs in the recommendation made to the House Energy and Commerce Subcommittee on commerce, Transportation and Tourism by SCA Services, Inc. and by the Envirite Corporation that, initially, Congress amend RCRA to specify a list of prohibited wastes for which a Best Management Practice of treatment would be required. The initial list would be drawn from waste streams that already are listed hazardous wastes under 40 CFR 261.31 and 261.32, and wastes for which there is an applicable and enforceable pretreatment standard in effect under the Clean Water Act.

The following hazardous wastes are proposed for restriction because the chemical compounds contained in these wastes are presently known to meet the concensus criteria for listing, i.e., they are toxic (carcinogens), mobile, persistent, and bioaccumulate. They are predominant contaminants in groundwater and at Superfund sites. Adequate data on their behavior in landfills exists to justify immediate regulation.

Chemical constitutents of these waste streams have significantly degraded landfill liner systems (both clay and synthetic landfill liners) in tests sponsored by EPA's Municipal Environmental Research Laboratory (MERL). A variety of treatment capacity is now available.

F001 and F002 are generic halogenated organic wastes and are pervasive groundwater contaminants. They contain volatile organic priority polluants which are generally the first chemcials detected in groundwater under leaky landfills. Treatment can be by solvent reclamation, incineration, or other regulated thermal decomposition processes.

F006 and F019 are concentrated toxic metal finishing wastes that contain a variety of heavy metals that do not degrade in the environment. U.S. EPA has proposed a pretreatment standard for the electroplating industry, which generates some of these wastes. These wastes can be treated prior to landfilling to produce a delisted non-hazardous waste.

K032–034, are chlorinated pesticides containing hexachlorocyclopentadiene (C56), a very toxic substance, with a threshold exposure value of 10 parts per billion (100 times more toxic than benzene); these wastes can be treated or incinerated.

K097 has chlordane, which is a highly persistent chemical which accumulates in organisms used for human food and is carcinogenic and mutagenic; these wastes can be treated or incinerated.

K042, 043 and 099 waste streams have the potential to contain TCDD (tetrachlorodibenzodioxin); wastes containing TCDD require special notice to the U.S. EPA prior to initiating disposal activities; these can be treated or incinerated.

This proposal builds upon the land disposal restrictions adopted by California and the Illinois law that bans land disposal after 1987 where treatment is technologically feasible and economically reasonable. It builds on the provision in H.R. 6307, the RCRA Reauthorization bill passed overwhelmingly by the House in the last Congress. That bill would have required EPA to promulgate a list of wastes, for which land disposal may not be protective of human health and the environment. The promulgation of a list would follow a study by EPA. A similar rulemaking mechanism has been proposed by EPA and by the Senate Environment and Public Works Committee. Congress should not defer to EPA the restricting of certain hazardous wastes from landfilling.

The likelihood of any discretionary list being publiched within the next three years is not very great, statutory deadlines to the contrary notwithstanding. EPA testified last week that it would take 2 years just to propose a list. EPA has not listed any new wastes since July, 1980, and has missed its own published deadlines for completing determinations for listing additional hazardous wastes. EPA under present and past Administrations has not complied with any RCRA statutory deadline. Experiences under other environmental legislation reaffirm the need for Congress to act. Statutory listing avoids delays from legal challenges to EPA regulatory listings. The need for explicit statutory listings also is underscored by the present turmoil within EPA, caused, in part, by the granting of too much discretion to the Agency by Congress. Specific statutory provisions will expedite, and assure, environmental protection. The Hazardous Waste Treatment Council therefore proposes that Congress itself specify hazardous waste streams which should not be land disposed.

H.R. 6307, and the California law now in place, focus on restricting chemical substances. Initially, Congress should restrict specified listed hazardous waste streams. The advantages of listing waste streams, rather than specific chemical compounds, include (a) the listed wastes are already regulated as hazardous, therefore the only issue is what should be the best management practice, i.e., is there (or will there be) an available treatment technology as an alternative to land disposal; (b) a waste

stream regulatory standard is more easily implemented because it by-passes debate over whether a specific waste or chemical constituent is present, and whether the concentration is de minimus; (c) the regulated community can easily determine if land disposal restrictions are applicable to a specific waste stream; and (d) additional wastes and chemical constituents can be added by future rulemakings to supplement this statutory list.

The criteria for specifying restricted wastes are now fairly accepted. As proposed in H.R. 6307 and by EPA in its agenda for rulemaking, and as implemented by California, land disposal of hazardous waste would be restricted based on the following characteristics of the waste or its constituents:

Toxicity,
Bioaccumulativity,
Mobility, and
Persistance.

Other factors should include incidents of environmental damage from land disposal and incidences of groundwater or surface water contamination, and restrictions adopted by states for disposal facilities. Wastes containing volatile halogenated organic compounds should be given priority for additional listings, since these compounds are not contained in landfills, can be treated, and have been identified as a major groundwater contaminant in or around Superfund sites.

A variance procedure for deleting a generator's specific waste can be incorporated. But the burden on the petitioner should be high. The petitioner should be required to demonstrate that alternative treatment does not exist or is not likely to be developed within a reasonable time, or that its particular management practice, i.e., land disposal, will assure that the RCRA standard of protection of human health and environment will be equal to or greater than that attained through treatment, over a time frame of at least the operating, closure, and post-closure period for the land disposal facilities. This would be a case-by-case determination, allowing land disposal for a limited time only. The applicant should bear such reasonable costs as are applicable.

Additional waste streams, or hazardous waste constituents, could be included through additional listings by EPA or by a petition. The burden should be easier to add a waste to be prohibited from land disposal than for a waiver from restriction. The presumption should be that any waste (particularly those listed under §261.31 and §261.32) should be subject to a BMP treatment requirement if land disposal of the waste may not protect human health and environment to a degree comparable to treatment.

EPA should respond to listing and variance petitions within a specified time period.

The requirement for a Best Management Treatment Practice for a specified waste stream would apply regardless of the quantity generated.

Land disposal should not be prohibited, but standards must be upgraded

The Hazardous Waste Treatment Council is not advocating prohibiting the land disposal of all hazardous wastes. Such an extreme step would be unworkable and unnecessary. There are some wastes, e.g., residues from treatment processes, or asbestos removed from schools (it is not a listed waste, but a clear environmental hazard), for which land disposal is the only management practice available. Some wastes can be treated to make them non-hazardous and acceptable for land disposal, e.g., metal finishing wastes. Some wastes are of sufficiently low hazard that land disposal can be used with minimum environmental risk.

The present standards regulating land disposal facilities must be strengthened. Specific deficiencies of the EPA land disposal standards include:

"Existing Portion"—the regulations exempt from the liner, monitoring, and leachate collection system requirements, until a final permit is issued, those portions of land disposal facilities that were included within the boundaries of the site's Part A application, even though the "existing" portion has never been used. This is another EPA regulatory loophole that Congress must close. Otherwise, it may take ten years for EPA and the states to complete the permitting of all interim status landfill facilities to close this loophole.

Regional Administrators may exempt land disposal facilities from the design and operating requirements without any nationally uniform or objective criteria, standards, or procedures. States may be administering a very complex program with little staff resources to assure environmental protection.

Specific hazardous wastes should be prohibited by Congress from land disposal.

Financial responsibility for the closure period should be required, a point on which both the Chemical Manufacturers Association and the Environmental De-

fense Fund agreed in recent House testimony, and on which the Hazardous Waste Treatment Council concurs.

Groundwater monitoring is one critical element to the effectiveness of the EPA strategy of containment through liners, monitoring, and leachate collection. There should be no exemption from groundwater monitoring for double-lined systems.

Air emissions may be significant, particularly from volatile organics, but EPA doesn't require any air monitoring.

There is no duty to clean up releases beyond the "compliance point," i.e., the boundary of the facility, as a condition for a permit.

HAZARDOUS WASTE LIQUIDS SHOULD NOT BE ALLOWED IN LANDFILLS

The Hazardous Waste Treatment Council, as discussed above, urges that land disposal should be the management practice of last resort. Where there are technologies to treat or destroy wastes, they should be preferentially applied; that will ensure demand and adequate capacity. The regulatory focus has been on the physical state of the waste, i.e., a liquid, rather than on its behavior in the ground. The regulation of landfills should focus on specific waste streams, regardless of whether they are liquid, solid or sludge.

We support the legislative efforts to restrict or ban hazardous liquids in landfills. Such controls should be effective immediately. But while necessary, a ban only on liquids is not sufficient.

It has been assumed that organics in sludges and solids will not migrate when placed in landfills. This assumption fails to recognize the dynamics of a typical landfill environment. An open landfill having a size of 210′ x 285′ in an area having an annual rainfull of 43 inches will be impacted by the generation of 1.6 million gallons of leachate from the precipitation. This analysis assumes no evaporation during the year the cell is open. While there may be some evaporation from a secure landfill, our experience indicates very little evaporation actually occurs in the eastern half of the U.S.

Rainwater has the capability to wash out the water soluble organics from the sludges and solids and bring them in direct contact with the landfill liner structure, resulting in a similar effect as leakage of liquids from buried containers. Some of these water soluble solvents can then come in contact with compounds which are only soluble in the solvents, resulting in the leachate containing a variety of organic compounds. Solidification of liquid organics by mixing them with kiln dust, chemical absorbent, or garbage (co-disposal) does not permanently bind these compounds. Thus, rainfall can wash these organics out of the solidified material. Sludges also add liquids to the landfill's total liquid load.

Unless the landfill can be operated in a dry environment, there is a great potential for rainwater to leach out organic compounds contained in solid and sludges and transport them to the liner system. Although leachate collection systems can be installed in the base of the landfill, there will always be some leachate in contact with the liner system, exacerbating liner degradation. Furthermore, as the height of the waste builds up in the landfill, the increased pressure provides an additional force to desorb the liquids that are contained in sludges and solidified wastes.

Continued restrictions on land disposal of liquid hazardous wastes are necessary, but not sufficient to minimize the risks of land disposal. Mixing bulk liquids with absorbent materials and landfilling the resultant sludge should not be an acceptable management practice. Certain wastes must be banned from landfilling regardless of their physical state, to provide long-term environment and public health protection.

At a time when scientists are questioning the long-term effectiveness of liner systems, EPA's research program must be increased and not cut back as proposed by EPA. We all recognize that the RCRA management system can be fine tuned better than now. Without better technical data on actual performances of landfills under a variety of conditions with a variety of wastes, the regulators and the regulated community must err on the side of conservatism. When in doubt, don't expose the public health and the environment to unnecessary risk by underregulating now, studying later.

CLOSE THE PRESENT REGULATORY EXEMPTION FOR FACILITIES THAT BURN HAZARDOUS WASTES IN UNREGULATED BOILERS AND CEMENT KILNS, OR THAT BLEND OR BURN HAZARDOUS WASTE FUELS

We also oppose the present EPA regulatory exemptions that allow facilities to burn hazardous wastes for the "primary purpose" of energy recovery without even minimal controls. While the EPA pursues the investigation, enforcement and prosecution of illegal and unpermitted releases and discharges of hazardous wastes on

the land and water, it has delayed and ignored its responsibility to even track one-half of the nation's hazardous wastes that goes unregulated into boilers. We don't tolerate uncontrolled dumping of hazardous wastes into a stream or a sewer. We shouldn't tolerate uncontrolled burning of hazardous wastes in boilers and cement kilns, just because the "purpose" is energy recovery. Congress should require EPA to regulate all facilities burning and blending hazardous waste for energy recovery, as passed by the House last year.

This loophole is another example of how EPA does not apply its regulations equitably among different management methods, how it fails to comply with the RCRA mandate of regulating "as necessary to protect human health and the environment," and how it fails to provide the regulated community with clear (and enforceable) regulatory standards. An incinerator regulated under RCRA must obtain a permit to burn hazardous wastes. It must demonstrate it is capable of achieving a destruction and removal efficiency (DRE) of at least 99.99 percent of the principal organic hazardous constituents (POHCs) in the waste feed. That means that a maximum, if any, of only 0.01 percent of the waste feed would be emitted into the atmosphere. Boilers and cement kilns do not have to be permitted under EPA's current regulatory exemption, and it is not necessary to demonstrate any minimum ability to destroy hazardous wastes or remove them from its air emissions.

An incinerator must control emissions of particulates and hydrogen chloride, through emission control systems such as packed-bed scrubbers and electrostatic precipitators. Very few industrial boilers are equipped with such emission control equipment.

Operating conditions are major determinants of the efficiency of an incinerator or boiler in destroying hazardous wastes. Incinerators are required to monitor operating conditions to assure the continued maintenance of the 99.99 percent DRE requirement. Monitoring requirements include combustion temperature, waste feed rate, air feed rate, and carbon monoxide emissions. No monitoring is required of non-permitted boilers.

Hazardous waste incinerators are designed to destroy a variety of wastes. A trial burn demonstrating performance is required, and sets the facility's operating conditions, which are incorporated into the permit. Boilers are designed for specific types and specifications of fuel. The substitution or inclusion of hazardous wastes in the feed can substantially reduce a boiler's ability to destroy hazardous constituents and increases the risk to human health and environment from hazardous emissions.

Boilers are not required to conduct any trial burns to determine operating and fuel feed parameters. Further, boiler operating conditions that maximize energy yield may be in direct conflict with optimization of hazardous waste destruction. For example, excess combustion air may be minimized to save fuel consumed, but it will reduce the air needed to completely oxidize and destroy all hazardous constituents. As a practical matter, the introduction of hazardous wastes normally requires higher excess air levels to ensure complete combustion.

Public health and environmental concerns

The EPA has not evaluated the effect on human health and environment of its boiler exemption; an exemption of 20 million metric tons or one-half of the total hazardous wastes generated annually. If all facilities burning hazardous wastes met the EPA incinerator permit requirement of 99.99 percent Destruction and Removal Efficiency (DRE), a maximum of 4,000 tons of hazardous emissions would be released. A study of burning hazardous wastes in boilers by Fred C. Hart, commissioned by one of our members, that under actual operating conditions, non-regulated boilers achieve only a 97-percent destruction efficiency. This means that national emissions of hazardous materials under present regulatory exemptions could amount to 1.2 million tons per year!

EPA has only recently begun to study the burning of hazardous wastes in boilers and cement kilns. This reversal of normal and prudent procedures, by deregulating first and then seeing what results from unregulated burning, is particularly questionable when EPA's 1980 background document to the incinerator regulation states "when known carcinogens are incinerated and if combustion conditions are not properly maintained in the incinerator, quantities of these compounds will be emitted from the stack and may affect the health of those humans exposed to them." Unfortunately, it is not an isolated instance.

The paramount consideration for regulatory attention must be the risk to human health and the environment from the transportation and storage, and from the emissions from a facility burning hazardous wastes. The purpose for which a hazardous waste is burned has little if any correlation with the statutory mandate to protect human health and the environment—whether it is blended with other mate-

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rials before being burned, or whether any particular energy recovery equipment is utilized.

A regulatory program is for industry and government protection too, establishing objective standards and requirements to assure the public and regulators of a facility's compliance with those standards. It should not be used to undermine the purposes of the regulations by allowing wholesale exemptions under the guise of resource recovery or beneficial use.

Congress must regulate all facilities blending or burning hazardous waste fuels

The Hazardous Waste Treatment Council supported the requirements of H.R. 6307 that would have required:

(1) The owners and operators of facilities blending or burning hazardous waste fuels to comply with the notice requirement of Section 3010;

(2) Hazardous waste blended fuels to be accompanied by a "label" to inform the purchaser that the fuel contains hazardous wastes; and

(3) EPA to develop standards applicable to all facilities blending and burning hazardous wastes equivalent to the existing incinerator standards. The report accompanying H.R. 6307 directed EPA to phase in such regulations, so that "good housekeeping" requirements, such as manifests, recordkeeping, monitoring, and waste analysis would be imposed as soon as possible, and not be delayed while EPA develops facility performance standards. These should be explicit in any reauthorization bill in the 98th Congress.

A variance procedure could be developed for facilities burning homogeneous waste that have been proven to be destroyed by the facility under specified operating conditions. For example, New Jersey exempts facilities from its incinerator standards if it is of a minimum size, has an air permit, is not in a residential unit or in a residentially-zoned area, is burning only on-site wastes, has a full-time qualified operator, and the fuel burned meets specified standards.

Certain hazardous wastes are known to be sufficiently hazardous or difficult to burn that Congress or EPA should prohibit their being burned in any non-permitted facility, just as certain wastes should not be land disposed. EPA has made a first attempt in banning low BTU wastes as "sham" recycling, and would therefore not qualify for the present exemption. This is not adequate to protect human health and the environment. Minimum fuel quality standards should be developed, based on a hazardous waste's difficulty to burn (position of the hierarchy of incinerability), halogen content, maximum allowable ash content, maximum levels of toxic metals and inorganics (particularly lead and mercury), maximum sulfur content, minimum allowable flash point, and minimum heat of combustion. If EPA doesn't know enough to set final performance standards, EPA knows that the unregulated burning of hazardous waste is dangerous, and must be brought under at least minimal control.

The costs to comply with EPA requirements are minimal. The Hart Report estimated that the costs to comply with "good housekeeping" standards would be $7,000 a year per facility, and the costs if full compliance, including trial burns, would be $76,000. This compares to a fuel cost savings to a 60 million BTU facility burning 50 percent hazardous waste of $2.5 million.

The Hazardous Waste Treatment Council opposes any exemption from RCRA incineration standards for small fuel burning facilities. As previously discussed, the potential environmental risk is greatest from small facilities. There is no compelling reason for a school, an apartment house, or a small commercial establishment to burn hazardous wastes.

CLOSE THE SMALL QUANTITY GENERATOR EXEMPTION LOOPHOLE

Generators of hazardous waste in monthly quantities of less than one ton, about four 55-gallon barrels, are exempt from RCRA regulation unless the waste has been one of the few listed as acutely toxic, or a state has chosen not to adopt EPA's Small Quantity Generator exemption. The generator may put these hazardous wastes in its disposal container, while the unknowing costing company picks up with the rest of the garbage and hauls it away to the local sanitary landfill. The landfill generator has no way of knowing that the trash may contain up to one ton of hazardous waste. The waste need not even be containerized. One day the truck explodes. One day the landfill catches fire. One day the groundwater is polluted.

There is no sound legal, environmental or economic reason for EPA to exempt small quantity generators from RCRA. The statute does not authorize such exemption. In fact, it requires regulation. EPA has been petitioned and sued to close this loophole, with no progress occuring over the past two years. (This is another example of why Congress must act to ban specific hazardous wastes from landfills.)

Surely a ton a month per generator from one hundred exempt small quantity generators will not have an environmental impact particularly distinguishable from one hundred tons of identical hazardous wastes generated by one person!

Compliance with notification, manifests, and transportation standards should not impose undue economic costs on the small quantity generator.

One of our companies, for example, has established a "milk run," small quantity generator collection service in the New England area. The range of costs for this service, which includes transportation, treatment, and disposal in Subtitle C facilities, is $60–$90 per 55 gallon drum. A small quantity generator pays $240–$360 a month, generating one ton (4 drums). This shouldn't drive anyone out of business. This service is very competitive with the costs charged in the Northeast to large generators, particularly considering it includes transportation costs.

The Committee also should consider that the pricing structure of solid waste collection and disposal for the generator is based on volume, not on weight or content. The generator usually pays a monthly fee based on the volume of the disposal container and the frequency of collection. Wastes from several containers and different generators are collected in the same truck and then transported to the landfill. The landfill operator charges a tipping fee based on weight. However, the collection company has no idea on how to proportion the weight charge so he typically charges on the basis of container volume and frequency of collection. Therefore, the small quantity generators are basically getting a free ride for their hazardous wastes. Thus, their argument that regulation of small quantity generators will significantly increase their cost of disposal is correct since they are presently paying nothing for hazardous waste disposal.

The impacts of new regulations can be lessened by allowing additional storage time, and by modifying DOT and state standards to facilitate smaller load pickups at a reasonable price.

In addition, it may be possible to identify waste streams which, if generated in small quantities, could be allowed to be disposed of in a Subtitle D landfill. The Hazardous Waste Treatment Council, of course, prefers that all hazardous waste, regardless of quantity generated, be disposed of in Subtitle C facilities—an unregulated ton a month per generator creates substantial risk which is borne by sanitary landfill owners. But recognizing that a transition period may be necessary, a Subtitle D landfill could accept small quantity generator wastes that have been designated by EPA for sanitary landfills. The landfill would have to comply with the EPA Guidelines for the Disposal of Solid Wastes (40 CFR Part 241) and Subtitle C location criteria. It should segregate incompatible wastes, and should comply with recordkeeping and periodic sampling and monitoring requirements.

Wastes not included for this special Subtitle D transition would have to be disposed of at a Subtitle C facility in accordance with applicable Best Management Practices.

All wastes, except for those specified as temporarily acceptable for disposal in an upgraded Subtitle D landfill, should go to a Subtitle C permitted facility, as proposed earlier. Small generator compliance with RCRA's Subtitle C requirements cannot be that costly and burdensome, since in states that have no small quantity generator exemption, or a smaller one than EPA's, there still are gasoline stations, dry cleaners, hardware stores, and other such operations. In assessing the impact of RCRA regulations, it also is useful to remember that small quantity generators and small businesses are not synonymous.

CLOSE THE DOMESTIC SEWAGE LOOPHOLE

Industrial discharges into a POTW are now exempt from RCRA regulation under EPA's "domestic sewage" loophole. Section 1004(27) of RCRA specifically excludes from the definition of "solid waste" any solid or dissolved material in domestic sewage. EPA has interpreted legislative intent to include within the "domestic sewage" exemption mixtures of sanitary wastes and other wastes, including industrial discharges, that pass into POTW's. If it is not a "solid waste", the material cannot be a "hazardous waste" regulated under RCRA. EPA justified deferring RCRA regulation by relying on the pretreatment program "to insure that users of sewer and treatment systems do not dump wastes into the system that will present environmental problems", 45 Fed. Reg. 3309 (May 19, 1980).

This reliance is misplaced.

The pretreatment program has yet to get off the ground, ten years after the landmark Federal Water Pollution Control Act Amendments of 1972 was enacted. OTA estimates that 5 million metric tons of toxic wastes are being discharged into POTW's without pretreatment. Many POTW's are unable to properly treat these

wastes. The result is that the hazardous waste is either discharged as part of the effluent from the POTW, or transferred to the sewage sludge.

This loophole must be closed. RCRA regulation should not be deferred to a non-existent pretreatment program that doesn't in fact remove the hazardous wastes from the sewage and doesn't remove the waste from sludge. The RCRA exemption should apply only where a categorical pretreatment standard is being implemented.

Municipal sewage sludge can make an excellent fertilizer when not contaminated by toxic metals and other hazardous pollutants. This loophole not only discourages treatment, but ruins what would otherwise be a valuable product and probable money-maker for financially hard pressed local governments. It's hard to legislate common sense, but in this case, Congress must act to set EPA straight.

HAZARDOUS WASTE DISPOSAL FEES

One of the key recommendations of the Office of Technology Assessment's Report was that economic disincentives to land disposal should supplement regulatory controls. OTA recommended that the present CERCLA tax on the chemical feedstocks used to produce all hazardous substances (including hazardous wastes) be eliminated and be replaced by a charge placed on the generator of hazardous wastes. The objective of a shift from a front-end to a back-end fee is greater cost internalization between the source of the problem (i.e., hazardous wastes) and the ones paying the charge (i.e., the generator of the wastes), to produce an economic incentive to disposal. The proposed fee would have an offset for recycling, and substantially lower rates for treatment than for land disposal. Adjustments would also be made on the relative degree of hazard and whether the waste goes to an on-site or an off-site facility (lower and higher respectively to reflect transportation risks). The total funds raised would be no less than now available under CERCLA. OTA did not propose any charge be levied on the treatment facility, in which we totally concur.

The Hazardous Waste Treatment Council is now reviewing the OTA proposal and several other initiatives to extend and expand the Superfund program. We would like to offer some/several observations on the OTA proposal, while reserving final judgement while we conduct our analysis.

Any future mechanism will have to address the same issues that were raised in the Superfund debate:

(1) Superfund covers releases of all hazardous substances, not just hazardous wastes from abandoned dumps, as EPA might lead us to believe. A hazardous waste disposer fee would unfairly relieve those involved in hazardous substances who are not waste generators from any financial responsibility. A waste end fee may therefore be an addition to, not in lieu of, a feedstock fee.

(2) Superfund deals with releases into the total environment. "Degree of hazard" is a concept that is very relative, e.g., risk of an explosion vs. risk of cancer; some think that what is poisonous in the air may be harmless if released in water. There is a big gap between the goal and implementation of a degree of hazard system.

(3) There is no escaping the fee. No hazardous organic chemical can be produced without using a feedstock, so the tax is easily collectible. A generator fee will be far more difficult to assess, especially with the potential variables suggested by OTA and added by Congress. Also, the Congress cannot delegate to the Treasury the setting of the tax rates. It must be set out in the tax law. There is a very clear trade-off between ease of administration and a desire to use the tax to influence generator behavior.

(4) How much of an increase in costs will cause a generator to shift management practices?

(5) Will a generator fee raise enough money to deal with past sites, post-closure costs, spills, and a compensation program? If it achieves its social objective of reducing wastes, it may not have enough money, especially for the future?

(6) If states administer the generator fee, as suggested by OTA, what will be the administrative cost, compared to the costs of the present feedstock tax.

(7) The data base for any fee is lacking. The EPA Annual Report hasn't been submitted to Congress. The Report to Congress on the fund, including alternative ways to raise money, is due no later than December 11, 1984. The Post-Closure Liability Fund tax will only start to be collected on April 1, 1983, so we have no experience on how it will work.

There is a trade-off between equity and ease of administration, and public policy questions about using the federal taxing power to influence behavior. The Hazardous Waste Treatment Council agrees that it is not too early to begin the debate on the future of Superfund, and alternative financing mechanisms. We share with OTA

and others the objective of making land disposal of hazardous waste reflect its true costs. We pledge our assistance in this effort.

CONCLUSION

The members of the Hazardous Waste Treatment Council have invested millions of dollars thoughout the country in high technology treatment facilities for hazardous wastes. We have done this without federal financial subsidy in the past, and do not seek any in the future. We have built and generated hazardous waste treatment facilities in spite of uncertainties over federal regulation, and in spite of powerful federal disincentives for generators to treat, rather than landfill, their wastes.

Our industry has supported strong federal laws, regulations, and their enforcement. We operate the most publicly-scrutinized, non-governmental industry. We must therefore do all within our power to convince a skeptical public that they should have confidence that government controls and our own management practices will be more than adequate to protect human health and the environment. The tragedy of our time is that the public is entirely justified in being skeptical.

The hazardous waste treatment industry cannot be expected to continue to invest in new treatment facilities when government policy keeps us operating at below capacity. We must question whether the federal government really believes that Congress is serious in requiring EPA to regulate "as necessary to protect human health and the environment" when more hazardous wastes are exempted from regulation than are regulated. We must question whether the EPA really believes that land disposal is the least desirable way to manage hazardous waste when it indirectly subsidizes landfilling and prices as out of the market.

The Resource Conservation and Recovery Act was going to fill in the remaining gap in environmental laws and protect the land and the groundwater from hazardous wastes. CERCLA was going to deal with the gap created by past disposal practices and the problems created by hazardous substances threatening the environment that didn't fit into any of Congress' or EPA's neat programmatic pigeonholes.

Six years after RCRA, we still have ten years to go before EPA will regulate all land disposal facilities. Unless Congress acts to close the RCRA loopholes, to reassert its authority over regulatory agencies, to restore public confidence, the environmental gains of the past decade will have been lost, the goals of a decade of environmental protection legislation unrealized. Unless Congress acts, the public will again be confronted with the need for corrective actions for past disposal practices. Unless Congress acts, the public will again be needlessly exposed to uncontrolled releases of hazardous pollutants. We in the hazardous waste treatment industry can only go so far alone. We look to Congress for the leadership to assure that hazardous wastes are managed in the best possible way, because that is the minimum required to protect human health and the environment.

I again thank the Committee for the opportunity to testify on behalf of the Hazardous Waste Treatment Council, and welcome any questions.

Mr. GORE. Thank you very much for that excellent testimony. We will have some questions at the conclusion of the panel.

Dr. Linda Gaines from Argonne National Laboratories in Argonne, Ill.

We are delighted to welcome you here, and look forward to your testimony.

Ms. GAINES. First, I would like to thank the subcommittee for the opportunity to be here today. The Department of Energy had asked Argonne National Laboratory to do a study for them on the energy and material savings possible for the industrial waste exchange. I am going to discuss what industrial waste exchange is, how it works, and why there are problems.

The waste exchange is a facility that enables industrial process wastes, either hazardous or nonhazardous, byproducts, surpluses, or materials that do not meet specifications, to be transferred from one company to another company where they are used as process inputs. Because many of these materials are of low or negative value, it does not pay to transport them very far. A waste exchange is therefore a regional venture by nature. On the other hand, the

area it serves must be large enough to include a variety of industries.

The waste generator involved in waste exchange benefits from the revenues from the sale of this waste and the avoided disposal costs, and the user benefits from the reduced raw materials cost. The Nation benefits from decreases in its dependence on imported resources, in energy required for raw material production, decreased public health hazards, and in amounts of land and money required for waste disposal.

Waste exchanges differ according to whether or not they actually handle materials. The most common type of waste exchange does not handle materials, but is an information clearinghouse. Generating companies inform the exchange about the quantity, composition, and location of the wastes they generate and the frequency with which the wastes are available. Companies wishing to use wastes as process inputs supply similar information about their needs. The information on wastes available and wanted is published in a catalog that typically appears quarterly and may be available free or for a small charge. To protect proprietary information catalogs are often confidential.

A party interested in using available wastes or supplying needed materials must write an inquiry to the exchange, which forwards the letter to the listing company. And there the function of the information clearinghouse generally ends. It is up to the listing company to contact the inquiring party and negotiate an exchange, which may involve a one-time transfer, several transfers or even the continuous transfer of wastes. The companies generally are under no obligation to inform the clearinghouse of the results of negotiation. They may even prefer to keep a good deal quiet from their competitors. Sometimes an information clearinghouse makes an active effort to find possible users for available wastes, most of which are not successfully exchanged simply by catalog listings. This function requires more than the usual small part-time staff. One waste exchange operator suggested that a central information service funded by the Departments of Commerce and Energy and the Environmental Protection Agency would be a good idea.

The other type of waste exchange is a materials exchange that, for a brokerage fee, actually takes possession of the wastes and participates in the negotiations. This type of exchange often actively seeks buyers for wastes. In some cases, the materials exchange performs minimal processing on the waste to make it a suitable raw material for the buyer's use. Still other companies, as their main line of business, reprocess wastes into valuable products for resale.

The second important characteristic of waste exchanges is their status as public, nonprofit operations or profitmaking businesses. This characteristic is not unrelated to the first; most information clearinghouses are operated and subsidized by government, chambers of commerce, or trade associations, and most materials exchanges are private enterprises. Little money is to be made by publishing a quarterly catalog, but materials brokerage fees do offer potential profits.

The third important characteristic of a waste exchange is the types of material it handles. The word "waste" is interpreted in various ways. Some people include surplus materials in their list-

ings, while others specifically exclude them. Other exchanges restrict their operations to materials for which no markets or extremely limited markets now exist. These wastes are generally disposed of at a cost to the generator, and these are the materials for which waste exchange offers the greatest potential savings. The written text includes a list of categories of such wastes.

Another necessary distinction is that between hazardous and nonhazardous wastes. Some exchanges handle only one or the other. Most hazardous materials are found in categories one, acids and alkalis; two, organics and solvents; three, metals and metal-containing sludges; and 11, organics.

The operative definition of hazardous is to be found in the Resource Conservation and Recovery Act of 1976 and its associated regulations.

Although RCRA deals with a number of topics related to resource recovery, the area of hazardous waste has generated the bulk of regulations and the most interest. There is a chain of regulation that extends from those who generate hazardous waste to those who transport, store, treat, and dispose of it. However, facilities that recycle or reuse hazardous wastes are excluded from these regulations for all wastes except those containing the most hazardous materials. This exemption should provide considerable incentive for material recovery, but because of the length of the regulations and their complexity, many people including some waste-exchange operators are not aware of it. Also, transport and storage of the particularly hazardous materials is still regulated.

Hazardous waste is defined in RCRA to be:

> A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness, or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Subsequent regulations define criteria for determining if a waste is hazardous and, in addition, list particularly hazardous materials for special consideration. These materials, for which transport and storage regulations apply even if the materials are to be reused or recycled, are listed in 40 CFR part 261, subpart D. Sludges are also regulated. In 40 CFR part 261, subpart C, four criteria for identifying hazardous wastes are ignitability, corrosivity, reactivity, and toxicity. It has been estimated that on the order of 20 percent of industrial wastes are hazardous, according to these definitions. And many of them are listed as available in waste-exchange catalogs.

The hazardous nature of these wastes is extremely important in determining the benefits of exchanging them, because the costs of regulated disposal, storage, and treatment may be avoided by recycling.

And it is important to note that the exact nature of the toxic waste will greatly be reduced. But it is important, also, to note that the recycling may still leave toxic residue. It is important to also note that the volume of the waste will be greatly reduced. But I don't think it is possible to get rid of all wastes. There will always be something left.

There are materials in almost every category of waste that could be exchanged with substantial benefits. Little information is available on actual exchanges. However, one clearinghouse estimates that only 20 to 25 percent of their listings resulted in exchanges. Another source estimates an average of 10 percent.

There are several major barriers that impede waste-exchanges. One barrier to the exchange of many wastes is the lack of economical technology for their treatment. This lack is greatest in the area of material recovery for them. And the word economical is very important. Technologically you can do almost anything. It may not be economical. This lack is greatest in the area of material recovery from mixed or contaminated wastes, such as sludges, close-boiling liquids, and mixed plastic or fiber wastes. Research on improved separation process is strongly recommended. In addition, industrial waste generators should be encouraged to think about recycling before they unnecessarily mix or contaminate process waste streams. Alternatively, process or feedstock modifications that result in less waste should be considered. The Government could provide incentives through tax credits or rapid depreciation allowances for capital expenditures that reduce the volume of hazardous wastes or make the wastes more amenable to recovery.

A second impediment to waste exchange is that many listings are for small quantities of materials or for materials available only once or dispersed over a broad geographical area. Generally, it is not economical to treat a small quantity of material, and a continuing supply of input is needed to justify purchasing equipment to treat materials that can't be reused as is. Thus, in the absence of economical small-scale technology, dispersed wastes must be collected and transported to a central recycling facility that receives material from many sources. Not enough of those facilities are in operation to treat available wastes. Their establishment should be encouraged in any way possible. Loan guarantees, regulatory exemptions, and tax relief might be possible.

The problem of dispersed wastes is compounded by the fact that the low value per pound of many of the materials, particularly those with high water contents, makes transport over large distances uneconomical. Therefore, research on appropriate methods for collection of dispersed low-value materials is badly needed. The methods would apply to recycleable materials in municipal waste and to biomass and biomass wastes as well. It would also be worthwhile to develop portable recycling equipment.

Many waste-exchange operators identify restrictive regulation of hazardous waste, and uncertainty and misunderstanding and fear of the regulations, as a major impediment to waste exchange.

First, many people do not realize that recyclers of all but listed hazardous wastes are exempt from RCRA regulations.

Second, RCRA mandates cradle-to-grave responsibility for generators of hazardous waste, who are liable for improper handling of their wastes by treatment facilities. Responsibility cannot be transferred to a licensed facility through contractual agreement. I want to emphasize the importance of this impediment. I recently was at a waste exchange conference and people are extremely concerned about their wastes being badly treated by recycling facilities and then they would still be liable for any damages. And so a lot of

people will just prefer to landfill their wastes when they know exactly where it is, they know what is happening to it rather than be uncertain about what it is being recycled to. So if it were possible to actually transfer the liability that would be a big incentive to waste exchange and other recycling operations.

Another impediment under RCRA regulations is that generators need a permit if they are to store listed hazardous wastes for more than 90 days, even if the wastes are to be recycled. However, waste-exchange catalogs are often published quarterly, and negotiations for transfer take time, so this restriction severely limits hazardous waste exchange. Finally, regulations concerning hazardous waste have changed several times and are changing again. The EPA is developing a new definition of solid waste that will affect recycling of hazardous wastes. Even if the new definition were clearer and exempted certain recycleable materials, the change is bound to cause additional confusion.

The resulting uncertainty deters companies from getting involved. Regulations must be finalized and people educated as to their proper interpretation. To complicate the situation even further, States have their own hazardous waste regulations, and these are not uniform. A waste may be listed as hazardous in one State and not in another. Numerous companies have sprung up to help waste generators cope with hazardous regulations.

In addition, the EPA maintains the RCRA hotline to answer questions about hazardous waste regulations.

Many companies are not aware of what materials are available and what they could be used for. Companies are also reluctant to deviate from established practices in waste handling. The current system works, and a new system is an unknown. Small companies often don't have the technical expertise either to recognize or to treat potentially usable materials. This problem can be solved in large part by an intelligent waste exchange that examines listings and explains to potential users how they could use specific materials. Most subsidized waste exchanges don't have the technical staff needed to do this, but many for-profit exchanges offer this service among others, and appear to be operating successfully.

Therefore, waste exchanges should be encouraged to find uses for available materials. Recycling companies that treat wastes to make them suitable for reuse and then seek markets for them, as well as consultants who help generators recover their own wastes, should also be encouraged through such means as tax or regulatory relief and loan guarantees.

In summary, although considerable savings of both energy and money are possible through waste exchange, several major impediments limit the number of actual exchanges that take place. These impediments include the lack of economical separation technology, the small quantities of material available at each site, restrictive or uncertain regulation, and lack of knowledge on the part of potential waste users. None of these barriers is insurmountable if appropriate action is taken.

[The prepared statement of Dr. Gaines follows:]

INDUSTRIAL WASTE EXCHANGE

by
Linda L. Gaines

TESTIMONY BEFORE THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES
MARCH 30, 1983

SUMMARY

Industrial waste exchanges have been established to assist in the transfer of waste materials to companies that can use them, as is or treated, to displace virgin raw materials as process inputs. A waste exchange may provide information that expedites the transfer, or it may actually take possession of the material. Benefits of industrial waste exchange include avoided disposal costs and reduced energy and dollar costs for raw materials. Uses can be found for most wastes listed in waste-exchange catalogs, including spent acid, waste solvents, and used lubricating oils; substantial savings of energy and dollars are often possible through recycling of these potentially valuable materials. Lack of economical separation technology, the small quantities available at some sites, restrictive or uncertain regulation, and lack of knowledge of a material's uses are all barriers to successful operation of industrial waste exchanges, but these barriers can be overcome by appropriate action.

1 WHAT IS A WASTE EXCHANGE?

A waste exchange is a facility that enables industrial process wastes, by-products, surpluses, or materials that do not meet specifications to be transferred from one company to another company where they are used as process inputs. Because many of these materials are of low or negative value, it does not pay to transport them great distances. A waste exchange is therefore a regional venture by nature; on the other hand, the area it serves must be large enough to include a variety of industries.

The waste generator involved in waste exchange benefits from the revenues from the sale of waste and the avoided disposal costs, and the user benefits from reduced raw-materials costs. Benefits to the nation include decreases in its dependence on imported resources, in energy required for

production of new materials, in public-health hazards, and in amounts of land and money required for waste disposal.

2 TYPES OF WASTE EXCHANGES

Waste exchanges differ according to whether or not they actually handle materials. The most common type of waste exchange does not handle materials, but is an information clearinghouse. Waste-generating companies inform the exchange about the quantity, composition, and location of the wastes they generate and the frequency with which the wastes are available. Companies wishing to use wastes as process inputs supply similar information about their needs. The information on wastes available and wanted is published in a catalog that typically appears quarterly and may be available free or for a small charge. To protect proprietary information and to discourage possible government involvement, catalog listings are often confidential. A party interested in using available wastes or supplying needed materials must write an inquiry to the exchange, which forwards the letter to the listing company. The function of the information clearinghouse generally ends there; it is up to the listing company to contact the inquiring party and negotiate an exchange, which may involve a one-time transfer, several transfers. or even the continuous transfer of wastes. The companies are generally under no obligation to inform the clearinghouse of the results of negotiation. They may even prefer to "keep a good deal quiet" from their competitors. A schematic showing how an information clearinghouse assists the transfer of wastes is shown in Fig. 1. Sometimes an information clearinghouse makes an active effort to find possible users for available wastes, most of which are not successfully exchanged simply by catalog listings. This function requires more than the usual small part-time staff. One waste-exchange operator suggested a central information service funded by the Departments of Commerce and Energy and the Environmental Protection Agency (EPA).

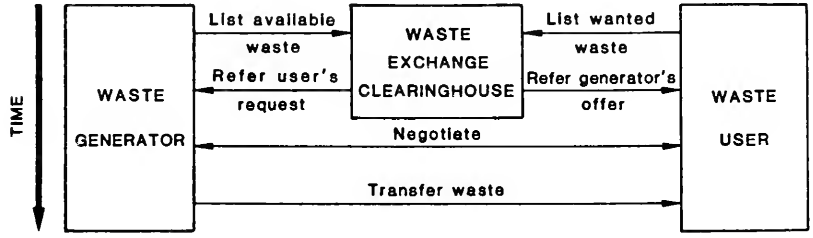

Fig. 1 Schematic of Waste Transfer Assisted by an Information Clearinghouse

The other type of waste exchange is a materials exchange that, for a brokerage fee, actually takes possession of the wastes and participates in the negotiations. This type of exchange often actively seeks buyers for wastes. A schematic of waste transfer through a materials exchange is shown in Fig. 2. In some cases, the materials exchange performs minimal processing on the waste to make it a suitable raw material for the buyer's use. Still other companies, as their main line of business, reprocess wastes into valuable products for resale.

The second important characteristic of waste exchanges is their status as public, nonprofit operations or profit-making businesses. This characteristic is not unrelated to the first; most information clearinghouses are operated and subsidized by government, chambers of commerce, or trade associations, and most materials exchanges are private enterprises. (Some privately run exchanges regard subsidized exchanges as direct competitors with an unfair advantage.) Little money is to be made by publishing a quarterly catalog, but materials brokerage fees do offer potential profits.

The third important characteristic of a waste exchange is the types of material it handles.

3 TYPES OF MATERIALS HANDLED BY WASTE EXCHANGES

The word "waste" is interpreted in various ways by the different waste exchanges. Some include surplus materials -- oversupplies of virgin materials -- in their listings, while others specifically exclude them. Other exchanges restrict their operations to materials for which no markets or extremely limited markets now exist. These wastes are generally disposed of at a cost to the generator, and these are the materials for which waste exchange offers the greatest potential for dollar and energy savings; a list of categories of such wastes is shown in Table 1.

Another necessary distinction is that between hazardous and nonhazardous wastes. Some exchanges handle only one or the other. Most hazardous materials are found in categories 1 (acids and alkalis), 2 (organics and solvents), 3 (metals and metal-containing sludges), and 11 (inorganics).

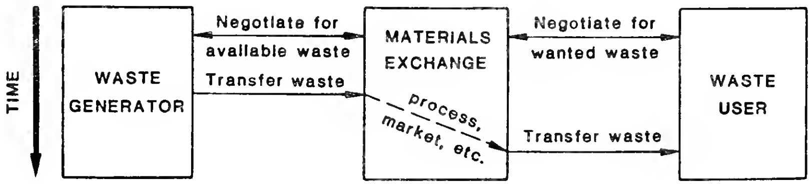

Fig. 2 Schematic of Waste Transfer through a Materials Exchange

Table 1 Categories of Wastes

Category Number	Materials Included
1	acids and alkalis
2	organic chemicals and solvents
3	metals and metal-containing sludges
4	minerals, including glass and sand
5	oils, fats, and waxes
6	food processing wastes
7	paper and wood
8	plastics and rubber
9	spent catalysts
10	textiles, fur, and leather
11	inorganic chemicals
12	other

The operative definition of "hazardous" is to be found in the Resource Conservation and Recovery Act of 1976 (PL94-580, RCRA) and its associated regulations (for example, 40 CFR Parts 260-265).

4 RCRA, HAZARDOUS WASTE, AND WASTE EXCHANGES

Although RCRA deals with a number of topics related to resource recovery, the area of hazardous waste has generated the bulk of regulations and the most interest. There is a chain of regulation that extends from those who generate hazardous waste to those who transport, store, treat, and dispose of it. However, facilities that recycle or reuse hazardous wastes are excluded from these regulations for all wastes except those containing the most hazardous materials. This exemption should provide considerable incentive for material recovery, but because of the length of the regulations and their complexity, many people (including some waste-exchange operators) are not aware of it. Also, transport and storage of the particularly hazardous materials is still regulated. (See 40 CFR §261.6 for the exact regulations that apply.)

Hazardous waste is defined in RCRA to be "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

(A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

(B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

Subsequent regulations define criteria for determining if a waste is hazardous and, in addition, list particularly hazardous materials for special consideration. These materials, for which transport and storage regulations apply even if the materials are to be reused or recycled, are listed in 40 CFR Part 261 Subpart D. Sludges are also regulated. In 40 CFR Part 261 Subpart C, four criteria for identifying hazardous wastes not specifically listed in Subpart D are defined precisely. These are ignitability, corrosivity, reactivity, and EP toxicity.* It has been estimated that on the order of 20% of industrial wastes are hazardous according to these definitions, and many of them are listed as available in waste-exchange catalogs. The hazardous nature of these wastes is extremely important in determining the benefits of exchanging them, because the costs of regulated disposal, storage, and treatment may be avoided by recycling.**

5 IMPEDIMENTS TO SUCCESSFUL WASTE EXCHANGE AND RECOMMENDATIONS FOR OVERCOMING THEM

There are materials in almost every category of waste that could be exchanged with substantial benefits. Little information is available on actual exchanges; clearinghouses do not usually collect statistics, and materials exchanges keep them proprietary. However, one clearinghouse estimated that only 20-25% of their listings resulted in exchanges; another source estimates an average of 10%.† There are several major barriers that impede waste exchange, and we recommend actions to overcome them.

One barrier to the exchange of many wastes is the lack of economical technology for their treatment. This lack is greatest in the area of material recovery from mixed or contaminated wastes, such as sludges, close-boiling liquids, and mixed plastic or fiber wastes. Research on improved separation processes is strongly recommended. In addition, industrial waste generators should be encouraged to think about recycling before they unnecessarily mix or contaminate process waste streams. Alternatively, process or feedstock

*Toxicity determined by an extraction procedure.

**Note, however, that recycling may still leave toxic residues.

†But once avenues are found for reusing waste materials, they are used routinely without further involvement of the waste exchange.

modifications that result in less waste can be considered. The government could provide incentives, through tax credits or rapid-depreciation allowances, for capital expenditures that reduce the volume or hazard of wastes or make the wastes more amenable to recovery (for example, by source separation).

A second impediment to waste exchange is that many listings are for small quantities of materials or for materials available only once or dispersed over a broad geographical area. It is generally not economical to treat a small quantity of material, and a continuing supply of input is needed to justify purchasing equipment to treat materials that can't be reused as is. Thus, in the absence of economical small-scale technology, dispersed wastes must be collected and transported to a central recycling facility that receives material from many sources. Not enough of these facilities are in operation to treat available wastes. Their establishment should be encouraged in any way possible. Loan guarantees, regulatory exemptions, and tax relief might be appropriate. The problem of dispersed wastes is compounded by the fact that the low value per pound of many of the materials, particularly those with high water contents, makes transport over large distances uneconomical. Therefore, research on appropriate methods for collection of dispersed low-value materials is badly needed. The methods would apply to recycleable materials in municipal waste and to biomass and biomass wastes as well. It would also be worthwhile to develop portable recycling equipment.

Many waste-exchange operators identify restrictive regulation of hazardous waste -- and uncertainty about and misunderstanding and fear of regulations -- as a major impediment to waste exchange. First, many people do not realize that recyclers of all but listed hazardous wastes are exempt from RCRA regulations. Second, RCRA mandates cradle-to-grave responsibility for generators of hazardous waste, who are liable for improper handling of their wastes by treatment facilities. Responsibility cannot be transferred to a licensed facility through contractual agreement. Third, under RCRA regulations, generators need a permit if they are to store listed hazardous wastes for more than 90 days, even if the wastes are to be recycled. However, waste-exchange catalogs are often published quarterly, and negotiations for transfer take time, so this restriction severely limits hazardous-waste exchange. Finally, regulations concerning hazardous waste have changed several times and are changing again.* The resulting uncertainty deters companies from getting involved. Regulations must be finalized and people educated as to their proper interpretation. To complicate the situation even further, states have their own hazardous-waste regulations, and these are not uniform. A waste may be listed as hazardous in one state and not in another. Numerous companies have sprung up to help waste generators cope with

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*The EPA is developing a new definition of solid waste that will affect recycling of hazardous wastes. Even if the new definition were clearer and exempted certain recyclable materials, the change will cause additional confusion.

hazardous-waste regulations. In addition, the EPA maintains the "RCRA Hotline" to answer questions about hazardous-waste regulations (800-424-9346; in Washington, D.C., 382-3000).

Many companies do not know what materials are available or what they could be used for. Companies are also reluctant to deviate from established practice in waste handling; the current system works, and a new system is an unknown. Small companies often do not have the technical expertise either to recognize or to treat potentially usable materials. This problem can be solved in large part by an "intelligent" waste exchange that examines listings and explains to potential users how they could use specific materials. Most subsidized waste exchanges do not have the technical staff needed to do this, but most for-profit exchanges offer this service, among others, and appear to be operating successfully.* Therefore, waste exchanges should be encouraged to find uses for available materials. Recycling companies that treat wastes to make them suitable for reuse and then seek markets for them, as well as consultants who help generators recover their own wastes, should also be encouraged through such means as tax or regulatory relief and loan guarantees.

In summary, although considerable savings of both energy and money are possible through waste exchange, several major impediments limit the number of actual exchanges that take place. These impediments include the lack of economical separation technology, the small quantities of material available at each site, restrictive or uncertain regulation, and lack of knowledge on the part of potential waste users. None of these barriers is insurmountable if appropriate action is taken.

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*This is not necessarily an argument against subsidized exchanges, because private ventures often handle only those materials from which the greatest profits are available.

Mr. GORE. Thank you very much. I found all three statements very interesting.

I would like to call first on Congressman Durbin.

Mr. DURBIN. I would like to appoint you all as Federal regulators and help me with a hypothetical situation. Are you ready?

We heard a suggestion this morning about a fee system, and I would particularly like to ask Dr. Gaines, we are talking about waste exchange here, what is your thinking about the imposition of fees for those who generate hazardous waste or toxic waste of some variety, and when should it be imposed?

Ms. GAINES. I would think if there is some possibility of the material being recycled, you generate impediments with such fees, and that would prevent recycling.

Mr. DURBIN. That makes sense. As you gave your testimony, it became increasingly apparent that there is a network being set up for this and the end user with the waste left over would be the one who should bear the burden if there is a fee system imposed.

Is this network fairly widespread nationwide?

Ms. GAINES. There are about 20 waste exchanges operating in the country with varying degrees of success.

Mr. DURBIN. And do you know what kind of volume is handled in comparison to what we generate as a nation?

Ms. GAINES. I think it is pretty small.

Mr. DURBIN. Is it the type of thing where the technology is promising?

Ms. GAINES. The technology is. It is partially a question of the economics and partially the impediments are rather strong. So, I don't know how to arrive at how promising——

Mr. DURBIN. Wouldn't you think that a change in attitude toward landfills or absence of a fee system would change the economics of that situation as well?

Ms. GAINES. That would certainly help also, yes.

Mr. DURBIN. I appreciate those comments, particularly since you are from the Argonne Laboratory, which I hold near and dear to my heart. I am glad you came by.

Mr. Ezell, you have heard the comments earlier about the fee suggestion. Do you think that is a move in the right direction?

Mr. EZELL. I do think that is a move in the right direction for a fee system for those materials that are land-filled to have a graduated fee system such as the higher risk materials have higher fee bills.

Mr. DURBIN. Do you feel that the landfill aspect of this, even from your perspective, is indispensible; we are going to have some sort of——

Mr. EZELL. I think as mentioned in my statement, every technology will produce some sort of residue that will need to be landfilled.

Mr. DURBIN. Do you have any comments on what kind of difficulties or obstacles we might run into if imposing a fee system would ultimately affect the industry you have dealt with?

Mr. EZELL. Accountability probably, and accounting for what is disposed and that type of thing. I think that would be the biggest problem.

Mr. DURBIN. We all want to avoid a Federal inspector knocking on every door to make sure that every gallon is accounted for. Is there any way you can see from an industry basis, either yourself or Mr. Robertson, where we could find some other way of doing this that would be—bring in the element of accountability you have mentioned?

Mr. EZELL. Maybe Mr. Robertson has some thoughts.

Mr. ROBERTSON. In the operating of our facility in Eldorado, Ark., we do have the PCB incinerator and we do have a permit or authorization requirement placed on us. And I think it should be explored for operation of any type of hazardous waste management facility. That is, we are required to employ an independent consultant through a listing. We list them and we submit them to the agency, they strike several and these are our options there. Then it is our responsibility to retain that party and pay that party and they have a scope of work set out for them. And I think this type of thing could be done. I think, it would also help to assure the general public that there is independent monitoring being done of the site other than from the governmental agency.

Mr. DURBIN. Let me make sure I am clear on this. You have an independent consultant that is hired by your company?

Mr. ROBERTSON. Yes, sir.

Mr. DURBIN. And do they report to the public or file some sort of auditing report?

Mr. ROBERTSON. They report within 24 hours directly to region 6 in our case. And they are required to report, it is either monthly or quarterly, in a written fashion to the agency. They are required—in our particular case, they are required to make five unannounced inspections per month. Those inspections have to include every operating shift and they have to include at least one inspection at night and one on weekends. So I think that if you have a fee system and with the operation of hazardous waste management facilities whether it is a treatment facility or land disposal facilities, regardless of whatever they might be, I think we need that type of policing action in the industry in order to assure the general public and to assure the generators that the product is being handled correctly. Obviously, the facility has to pay them, and you have the right to fire them. If you do, then you do not operate. So I think it is a pretty good deal, I believe.

Mr. DURBIN. Mr. Ezell and Mr. Robertson, you have both been on the private side and have seen how this is handled. You may have heard the testimony earlier of Henderson County and the experience they had. Have you found that with the proper public education that you could bring in your type of facility and would be warmly received in the community?

Mr. EZELL. I think with proper education that it would be warmly received. And I think with total communication with the public as part of the education process, it would be received. Yes, sir.

Mr. DURBIN. Have you had that experience, too?

Mr. ROBERTSON. My experience is totally the opposite. We have been involved in this now since 1972. We say that we know ten thousand and one things not to do, we do not know everything to do.

We have been through—since 1978 we have been through, I believe, nine public hearings. The first was the most violent that I had ever attended. It was 450 screaming, shouting people that wanted to run us out of town.

The last one was not quite that bad. We had about 60 people there, 35 that worked for us, and it was a very—I think it was a good hearing.

It has taken a long time for us to establish ourselves in the community of Eldorado, Ark., that is a town of 25,000 people. We work approximately 200—between 275 and 300 people at the facility in Eldorado, and we rank as one of the top 10 employers in the town. Even so and with that we still have those people in town that wish we weren't there.

I asked Mr. Dyer, when he came back from lunch, I said, I just have to ask you a question. If we wanted to locate an incinerator in Henderson County what type of reception would we receive? And I think his answer was that it would not be a very positive reception.

He did ask, would it be possible to locate a small facility to handle maybe just the waste generated in Henderson County, and, yes, I guess you could. But unfortunately there is no one magic black box that will treat every chemical. So the economics of scale come into play.

Mr. DURBIN. Are you aware of any regional contacts among States or different areas where they cooperated in disposing of wastes whether it was hazardous, toxic, low-level radioactive, or anything of that nature?

Mr. ROBERTSON. I try to keep radioactive out of hazardous, if you don't mind. The State of Arkansas has legislation passed 2 years ago that requires a cooperative agreement between the States for disposal of waste in Arkansas. We have no disposal facilities. Our facility is strictly a treatment facility. I am not aware of any pacts that are in existence other than the ones that are being worked on now for the low-level radioactivity.

Mr. DURBIN. The comment you just made about Henderson County kind of brings to my mind that each person would like to keep their own nest clean, but our nests are a lot bigger than we really imagine when it comes to what we are consuming as a public.

Mr. ROBERTSON. One other comment Mr. Dyer made—is he still here?

Mr. DURBIN. Go ahead and quote him. He is not here.

Mr. ROBERTSON. He said we would prefer to see the hazardous waste facility or the disposal site located in the metropolitan area where the wastes are generated. It is interesting in the fact that Eldorado, a population of 25,000 people, consider themselves to be a metropolitan area. And it is 100 miles from everywhere, believe me. It is 120 miles to Little Rock, 90 miles from Shreveport, et cetera.

The people in Eldorado in our early public hearings, said they thought it should be located in a remote rural area. And I guess it is—what do they call it, the not me syndrome? Not in my backyard?

But I think really the siting issue is a very important issue, and I think it comes to people trying to find trust in the government, the

State, Federal, in the industry, small industry, large industry. And certainly the recent upheavals in the regulatory agency and the recent upheavals in our waste management industry are not things that build trust in the minds of the public.

Mr. DURBIN. There are two elements I would like to just close on here: What efforts do you make once you open a facility to guarantee that you are not polluting the environment around the facility? And, second, what efforts do you make to monitor the health of your own employees during the process?

Mr. ROBERTSON. We have—on the latter, first, on the employees. Our plant is a union plant, and as part of the union contract—we did have it in effect before that, however—we do conduct physicals, pre-employment physicals. I am not certain of the frequency of the physical thereafter, 6 months or a year, but there is a frequently scheduled physical. And there are certain things that we look for that would be tied to the organic chemical industry. We happen to be 35 miles from Magnolia, Ark., which is where a thing called dipromuchlor propane is manufactured by Dow Chemical. And it had quite a sensational story in the media concerning sterility. So obviously one of the things we check is fertility in our male employees' sperm count. The program has been set up by an outside physician.

We have recently established a fund and donated the proceeds to the University of Arkansas to perform health studies in the area around our plant in Union County.

Union County, Ark., is the heart of the bromium industry. And we have three bromium plants in the county. We have about a 40,000 barrel-a-day refinery there and some other chemical plants in the area. So, it is a chemical area, not quite what you would find, say, in the area of south Louisiana where it is along the Mississippi, but for a small area we do have quite a few chemical plants. So we think that the health study of our employees will be beneficial to the entire area.

Mr. DURBIN. Thank you, I enjoyed the testimony.

Mr. GORE. Dr. Gaines, you said that not all wastes can be treated or rendered inert or exchanged or recycled; some of it will still remain and have to be perpetually stored. I am wondering, what percentage of the total hazardous waste generated in this country today would you estimate is susceptible to the alternatives disposal technologies, and what percentage will remain even after the best technology is applied? Do you have any guess on that?

Ms. GAINES. It would really be a guess. My belief is that almost anything can be treated or recycled to make it less harmful or much smaller in volume. For instance, if you incinerate something, you are left with ashes, generally not harmful and that can be landfilled safely, I believe. And the ashes would be only a small percent of the volume of the original material.

If you have some waste solvent, and I think Mr. Ezell would be more expert on this than I am, and you distill it to make a new solvent out of it or cook it, there is still residue left at the bottom and that may be rather useless. It may be something that can be incinerated and reduced further. So I would think that only a few percent is really left at the end if you do everything you can technically.

Mr. GORE. Mr. Ezell, if you do everything you can technically, what percent is going to be left over that will have to go into the landfill somewhere?

Mr. EZELL. Totally for all wastes, I don't know the number.

As Dr. Gaines pointed out, there is technology available. Incineration would reduce the volume by 99 percent. Our particular facility will reduce the volume by 88 percent. There are some refractory materials that can't be broken down to a harmless state.

And it may, as I pointed out in my testimony, it may take a combination of technologies in order to render these less hazardous so that you can put it in landfill. But the numbers I don't know.

Mr. GORE. Do you have a response to that, Mr. Robertson?

Mr. ROBERTSON. I think that it would be strictly a guess, Congressman.

Mr. GORE. Mr. Robertson, you said that your association, the Hazardous Waste Treatment Council, believes that Congress should pass a law banning the land disposal of certain kinds of hazardous wastes, correct?

Mr. ROBERTSON. Correct.

Mr. GORE. And you mention four. Halogenated solvents, pesticides, metal finishing wastes and potential dioxin containing wastes.

Mr. ROBERTSON. Yes.

Mr. GORE. Are there others that a reasonable person would add to that list?

Mr. ROBERTSON. I don't know exactly what page it is in the more complete testimony that I have provided you with, but we have listed—on page 11 of the full text, we have listed them by number, F001, F002, F006, F019, K032-034, K097, K042, 043, and 099.

Mr. GORE. What are these numbers now?

Mr. ROBERTSON. These are numbers out of the RCRA on ways——

Mr. GORE. These are the river categories?

Mr. ROBERTSON. Correct. We felt that they are—these are wastes that are known to be persistent in the landfill. They are known to be bioaccumulative. They are known to migrate. They are known to deteriorate the liner system, et cetera. It is a simple place to start. We believe, also, though, that the EPA should then start looking at other chemicals, specifically as to whether or not they should be land filled and perhaps look at the number of technologies—given the opportunity for technologies to be developed.

Mr. GORE. Now, the RCRA reauthorization bill which passed the House of Representatives last year——

Mr. ROBERTSON. Yes.

Mr. GORE. But did not pass the Senate last year did contain a list of substances that would be prevented from going into any landfill, is that right?

Mr. ROBERTSON. Correct.

Mr. GORE. Now, this year, we will have an opportunity to vote again on that bill, and hopefully the Senate will vote on that bill this year, also, because it is likely to contain a similar provision when it comes up this year.

Now, Mr. Ezell, you enjoin us to remember that land disposal and recycling are mutually conclusive processes. What you mean

by that is you want us to recognize that by encouraging recycling we will be encouraging technology that by their nature produced residues though smaller in volume which are necessary to dispose of in landfills. Is that sort of what you are saying?

Mr. EZELL. That is correct.

Mr. GORE. All right. Now, what about the availability of data on different categories of wastes, the sources of waste, the degree of hazard, the physical and chemical characteristics? Do we have a problem in this country with inadequate data, or has it been improved now to the point where we rely on it?

Mr. EZELL. I cannot speak for the whole industry. I can speak for SLTC in that our process provides for the prequalification of any waste materials before we accept it for treatment. So we generate that data internally. If it is not acceptable for treatment in our facility, we won't accept the material.

Mr. GORE. OK. Let me ask a couple of questions about these alternative technologies. First of all, I want to ask you a question about relative costs. If you look at high temperature incineration, chemical thermal-biological treatment, and the rest, which would be the most expensive?

Mr. ROBERTSON. I believe that you would find probably the most expensive process to put in operation now would be the high temperature incinerator or that would meet the RCRA standards being proposed or the six 9's construction fee required.

Mr. GORE. By six 9's, you mean 99.9999?

Mr. ROBERTSON. Right.

Mr. GORE. Percent eliminated. Give me a ballpark figure for how much per ton or how much per pound.

Mr. ROBERTSON. To process waste or are you talking about——

Mr. GORE. High temperature incineration of waste.

Mr. ROBERTSON. High temperature incineration of waste right now the fees range from as little as 7 or 7½ cents per pound to, the highest number I have seen in quite sometime, is up in the range of about 25 to 30 cents a pound.

Mr. GORE. And the difference is——

Mr. ROBERTSON. Generally, because of either the toxicity of the material or the constituents such as a high chlorine, high bromium, the content, the cost of the neutralizer to run through the incinerator, and perhaps the degree of risk in the unit itself.

Our fees for incineration of PCB materials, I guess, demand the highest price of anything around now. Our fee is about 50 cents a pound——

Mr. GORE. Have you had an opportunity to evaluate the University of Tennessee technology on PCB that was——

Mr. ROBERTSON. They use at Tullahoma?

Mr. GORE. Yes, sir.

Mr. ROBERTSON. Yes, sir. We evaluated it and thought very highly of it and acquired it.

Mr. GORE. All right. Now, what is the next most expensive? Chemical treatment?

Mr. ROBERTSON. You are getting into an area I am really not qualified on. But that would seem to me to be a logical step down the ladder. If I could put in just one thing.

One of our members just recently completed construction on an incinerator, and they spent $22 million, and took about 2½ years to permit it. And in the, again, in the more detailed testimony there, there is a comparison made to comparing it to landfill—to build a landfill to RCRA standards would be roughly about $8 million and the cost would be recovered much faster and so forth.

Mr. GORE. But in looking at the economics of all these alternative technologies, we are really looking at short-term costs and what the testimony has been telling us is that we have got the long-term costs in order to see why the alternative technologies are clearly superior. Because the long-term costs of landfills are just enormous and unacceptably high.

Now, the reason halogenated solvents are on your list of things that ought never go into landfills, is because they cannot be contained by clay or liners. Is that basically it?

Mr. ROBERTSON. Correct.

Mr. GORE. And they eventually work their way down into the ground water?

Mr. ROBERTSON. Correct. And I think this is being borne out in the Wilsonville situation in Illinois. Which by the way, even though it is a very sad situation, Congressman, I think it is going to give us a tremendous opportunity to learn what has happened to a landfill that has not been there for 15 or 20 years. As it is being excavated, I think you are going to learn a lot of things that can benefit this subcommittee.

Mr. GORE. Are we taking the proper steps to make sure we learn those lessons and take advantage of this unique opportunity for research?

Mr. ROBERTSON. I think that certainly that SCA will make all the publicity out of it they can.

Mr. GORE. OK. I guess I find that reassuring.

Mr. ROBERTSON. I find it very reassuring. I find it reassuring from the standpoint that the company has accepted the responsibility to do it and I don't believe they have asked for any Federal funds and I don't believe they have asked for any money from the customers.

Mr. DURBIN. Mr. Robertson, as a matter of record, they accepted it after they were urged on by several judges.

Mr. ROBERTSON. I understand that.

Another point, though, however, it was a site permitted by the State of Illinois Environmental Protection Agency.

Mr. DURBIN. That is true. We learned in the process also.

Mr. ROBERTSON. That is true. We all do.

Mr. GORE. Now, halogenated solvents, what would you say about a site—let's say we have a disposal site that we know has received a large quantity of halogenated solvents, and it is above an underground aquifer that provides drinking water for lots of people. Yet, between the dump site and the aquifer is a lot of clay. What would you do if you were charged with the responsibility for protecting the public health and you were confronted with a situation like that? What would you do?

Mr. ROBERTSON. You are an attorney, right?

Mr. GORE. Pardon me?

Mr. ROBERTSON. You are an attorney, right?

Mr. GORE. No, I am not.

Mr. ROBERTSON. That is an excellent question. It is a question that I would hope that I would never have to be asked to make a decision on.

With what we know now happens with chlorinated solvents, halogenated solvents, migrating through clays, and with what we are continuing to learn, I would find it very difficult not to say that those materials needed to be removed.

Now, as happens in disposal in the first place, it then comes to the economics. What is it going to cost to do it?

Mr. GORE. Yes. Well, there are certainly some locations that fit that description.

Mr. ROBERTSON. Yes, sir.

Mr. GORE. And a lot of them.

Well, let me see now. In general, everyone on this panel would agree that we need to, as a country, move much faster toward making these alternative technologies readily available. You believe they are economically feasible today, particularly when the long range costs are taken into account; that we need to correct the distortions in the market place which discriminate against these technologies by ignoring the long-term costs and eliminate other distortions in the economic and regulatory system that slow down our adoption of these technologies. Is that a fair summary?

Mr. ROBERTSON. Fair summary, yes.

Mr. GORE. Thank you all very much. I appreciate your testimony. Thank you.

I would now like to call to the witness table our fourth and final panel: Prof. Malcolm Getz with the Department of Economics at Vanderbilt, Robert L. Stoots with the Tennessee Eastman Co. in Kingsport, representing the Chemical Manufacturers Association, and Mike Cook, Deputy Director of the Solid Waste Office of the Environmental Protection Agency in Washington.

Gentlemen, if you would come to the witness table we would appreciate it.

Let me say at this point that we will include the statement of Mr. Kent Stoddard, the director of the toxic waste assessment program in California. He is sick today and had to cancel for that reason.

We are delighted to have all three of you join us on this occasion. Without objection, your prepared statements will be put into the record, and Professor Getz, we will begin with you, and welcome.

[NOTE.—Mr. Stoddard subsequently presented testimony at the May 4th hearing:]

STATEMENTS OF PROF. MALCOLM GETZ, DEPARTMENT OF ECONOMICS, VANDERBILT UNIVERSITY; ROBERT L. STOOTS, TENNESSEE EASTMAN CO., REPRESENTING THE CHEMICAL MANUFACTURERS ASSOCIATION; AND MIKE COOK, DEPUTY DIRECTOR, SOLID WASTE, ENVIRONMENTAL PROTECTION AGENCY

Mr. GETZ. Thank you very much. I think I represent a different point of view than you have heard today. There has been a lot of talk about economics, and I am an economist. I am not a chemist, I am not a toxicologist and there are a lot of things that I am not

able to talk about in an expert way, but I think I can bring a point of view that will be somewhat different than what you have heard to this time.

I would like to say at the outset that the proposal for a tax on the waste products as they leave plants, where the rate of tax would be linked to the degree of hazard which those wastes pose, reflecting the way in which they are treated and discarded, I think that is an excellent idea, and I think you will see more of that as I go through my statement.

The first thing I would like to say is that I think that regulation of hazardous waste areas is a very good idea. There are other areas of the economy where I think regulation has been disappointing and where we have made some real progress by rolling back regulation. But in the area of hazardous waste, I believe that regulation is necessary because there are important risks, which as individuals we are not able to assess and where some collective action can make us better off.

At the same time, I would like to say that our capacity to regulate is limited. It is limited because we have limited budgets that we are able to give to our regulatory agencies. Even the Environmental Protection Agency at Federal levels had budget cuts because we have an administration that is not very enthusiastic about regulation. Even if we had an administration which were more enthusiastic, there is still a real limit on the amount of budget funds which can go to the Environmental Protection Agency. And the environmental area has a variety of things on its agenda, so that hazardous waste will be only one petitioner among many concerned in the environmental area. So, there is a limit at the Federal level. There is even a more strong limit at the state level. State governments have budgets they must live within, and there have been a number of people who call for increased enforcement efforts. But I think it is important to recognize that there is a limited extent which we can expect the States and the Federal Government to be able to enforce its regulations. They can do somewhat more than at present, but there is a limited amount that can be done. A more subtle limit on our capacity to regulate is a limit that we impose on firms in increasing their cost of business, and in turn those costs being passed on to consumers. It is important here that there be a balance between the benefits that we receive from more careful handling of hazardous wastes against costs. Those are very real benefits, they are important benefits. But at the same time the cost that we incur should bear some relationship to the two kinds of benefits we get back, and that point will be made more clearly in a minute.

As we think about the limit to which we would want to impose additional cost on consumers and on businesses, we ought to reflect upon the fact that the chemical industry has been a very important source of productivity gains in this country over the last century, that our workers improvement in productivity has come in substantial measure as a consequence of success in the chemical industry. And if we do things that hold back and inhibit the chemical industry, that will be a—as a consequence to that, will be likely to result in retardation in improvements in productivity. Similarly, the success of our industry in international competition depends

upon the level of productivity that our workers are able to bring to bear in the workplace. If we adopt such regulations which hold back productivity which make it more difficult for us to compete in international markets, we are going to suffer a reduced standard of living.

I think it is appropriate to do some regulation, to bear some cost, but there is a limit. And the question really is to define an appropriate balance here.

If we accept on the one hand that we need regulation, and on the other that we have a limited regulatory capacity, then I conclude that what we need to do is focus our regulatory efforts where they will do the most good.

If we design regulations which respond in every conceivable hazard, we will be chasing will-o'-the-wisps all the time. We will spread our regulatory resources too thin. We will not be able to do as careful a job in those places where it is most important to do a careful job. Let me say this very clearly: We can save more lives by concentrating our efforts where they will do the most good.

Current regulations describe very comprehensive standards for definition of what constitutes hazardous waste. Those are not perfect, from the comments today, there are really things which really are hazardous which are not included in that definition, and there are things included in the EPA definition of hazardous waste which aren't really hazardous, but the statutory requirement is that anything that is of hazard or of potential hazard should be defined by the EPA as hazardous. What I am arguing is that it would be helpful if we had a more careful definition which said when we say something requires very elaborate treatment, we only mandate that when it is something that is very hazardous.

The regulations do establish a variety of exclusions. These exclusions, however, are unrelated to the character of the risks. The exclusions from the regulatory program are a consequence of administrative convenience. We exclude households entirely. The legislation does that, I believe. We exclude small generators. A number of people commented on that today. It is in the regulations that over a period of time they expect to reduce the level for the small generators, but there is no application of a degree of risk, and the exclusion of 1 metric ton per month is the same whether it is a terribly hazardous waste or a not very hazardous waste.

In the present regulations there is no recognition of the level of dilution. If waste material is diluted, it is treated just the same as though it were undiluted. A teaspoonful of saccharine—saccharine is listed on the list of hazardous waste and it is a potential hazard. But it is much less hazardous than many other things that are on the list. A teaspoonful of saccharine in a whole truckload of distilled water makes that whole truckload required to be treated in exactly the same way as though that were a truckload of the most highly concentrated toxic stuff around. That is the kind of silliness that I think arises because we have not taken account of the degree of risk. The failure to focus our regulatory effort means that a regulation is much less effective than it should be.

By having a very comprehensive set of regulations, we enormously increase the demand for legal disposal. At the same time by frightening us all that the potential of every bit of material, which

is classified as hazardous being used generally by the public as though it was the most hazardous thing means that the supply of ways of handling hazardous material has been radically restricted by the regulation. So that the price of legal disposal has gone way up, and Congressman Gore has commented on that several times, and appropriately so. But one consequence of that is that the relative cost of illegal disposal, midnight dumping, as opposed to legal disposal, has gotten moved in the favor of illegal disposal. So there may now be instances where illegal disposal has been of much more deleterious effect on the public health, spreading by the sides of country roads than traditional disposal practice. To that extent one needs to be careful essentially trying to raise the cost of land filled disposal as a way of inducing people to go to alternative technologies, because as you raise the cost of landfill, one possibility is that there are more, even worse, midnight dumping style of disposal.

I submit that it would be very difficult to induce recycling and recovery unless one establishes classes of risk and by establishing classes of risk identifies a relatively small quantity of extremely hazardous waste where one can have a much more elaborate enforcement mechanism and be much more sure that those wastes do not escape into illegal chance.

I believe the Congress could help here if the legislation would recognize differences in hazardous waste. In particular, I believe it would be significant to recognize that many wastes which are classified as hazardous are no more hazardous than many other kinds of risks which we confront in every day life, that what concerns the public the most and rightly so, are those wastes which represent substantially higher levels of risk than ordinary risks which we cope with. If the criteria were written into the legislation and made use of by EPA to color those wastes as hazardous only those materials which really represent extraordinary hazards, hazards above ordinary levels of risks that we live with every day, we would have much more manageable regulatory problems and we could do a much better job with dealing with those wastes.

I propose, and again, I am not a chemist, but this is one idea. One possibility is to recognize the mutagenics wastes is what really concerns us. That is where the really long-term, difficult to manage, difficult to predict problems arise. Even people who work with it all the time may be unaware of the mutagenics properties of given wastes. If we could focus our attention on those—that class of waste, maybe we could do a much better and more careful job there and really save more lives and improve the public health much more effectively than if we deal—try to deal with everything a potential hazard viewing as a goal ultimate security from a hazardous waste.

The Congress and the Environmental Protection Agency, it seems to me, have exploited the fright value of hazardous waste. The result is a an overly ambitious set of regulations. These regulations cause harm because of the inducement to illegal disposal. These regulations are much less effective than they should be because they are not focused on things that cause the greatest damage. And I believe that the effort to impose a tax on a waste by varying the tax rate with respect to the degree of hazard would be

much more feasible if some low risk categories of waste were excluded entirely from the regulation.

Thanks very much for the opportunity to speak today.

[The prepared statement of Professor Getz follows:]

FOCUSING HAZARDOUS WASTE REGULATIONS

Comment by Malcolm Getz
Associate Professor of Economics
Vanderbilt University
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Presented at Jackson, Tennessee
March 30, 1983

REGULATION IS A GOOD IDEA.

I am pleased to be able to comment on our efforts to improve public health and safety by controlling hazardous wastes. People are justly concerned about exposure to noxious chemicals. Inadequate disposal of wastes can poison ground water and denature soils. As a result, such wastes may harm people far removed in time and place from the waste dump without them even recognizing the cause of their injury. In some cases, the injury itself can remain latent for many years after exposure. Thus, the connection from disposal to observed harm may never be made. Without a regulatory effort, persons who mishandle wastes may escape responsibility for their actions. A carefully designed regulatory effort should improve our health and sense of safety by encouraging responsible disposal practices.

OUR CAPACITY TO REGULATE IS LIMITED.

Nevertheless, our regulatory effort is limited. The most obvious limit is in taxpayers' willingness to expand budgets. The hazardous waste program must compete with other budget requirements in the environmental area; the environmental regulation budget must compete with other claims for federal dollars. Although cuts in the last two years might be restored by an administration with more enthusiasm for regulation, the amount of effort would still be limited.

Taxpayers impose similar limits on state agencies. The number of investigators, prosecutors and clerks likely to be available to monitor the flow of hazardous wastes might increase, but decreases are also conceivable. It is unrealistic to expect quantum increases in the national regulatory budget.

A more subtle limit on our capacity to regulate is in the costs

imposed on firms and consumers. Firms must incur additional costs in meeting the paperwork and inspection requirements of regulation, as well as the cost of any other mandated activity. In the long run, these costs are borne by consumers in the form of higher prices or by workers in lower wages. To a considerable extent consumers and workers will be unaware that the higher prices and lower earnings they receive are a cost of the regulation. Nevertheless, higher price levels and reduced income and employment are important sources of dissatisfaction. When excessive regulatory costs are imposed on consumers and workers, we can expect their dissatisfaction to show up in voting and otherwise. The benefits we should expect to receive from the regulatory effort should balance against the costs we bear.

Of special importance is the effect of these costs on the pace of innovation and on the international competitiveness of our industry. The chemical industry in particular has been an important source of ideas that have enhanced the productivity of workers over the last century. The resulting productivity has also been an important source of our success in international markets. We depend on the steady flow of new products and new techniques to enhance our standard of living and to give us an advantage in trading with other countries. When excessive regulatory costs are imposed on firms in the chemical industry, we are apt to slow the pace of innovation and so to retard the rate of increase in productivity. We are especially likely to see the effect in a loss of competitiveness in international trade. Our ability to impose regulatory costs on firms is limited by our desire to avoid excessive reductions in our standard of living, our rate of productivity gain, and our ability to compete in international markets.

WE SHOULD FOCUS OUR EFFORTS
WHERE THEY WILL DO THE MOST GOOD.

We can identify many hazards around us. We can imagine a regulatory response to each one. If we try to launch a regulatory program aimed at every potential hazard, we will stretch our effort so thin that none will be successful.

Our limited regulatory efforts will do the most good if we concentrate them on the most severe hazards. There are some extremely hazardous wastes. For example, very mutagenic materials pose grave threats because small quantities can have potent but latent effects on many people. Rigorous and thorough regulations here are very important. In contrast, other hazardous wastes pose much less significant threats. An

explosive material may harm a few people who handle it, but the effect will not extend beyond an acute incident. A regulatory program will save more lives and yield a higher level of safety if it concentrates its limited effort on very hazardous wastes and avoids expending its effort on much less important hazards.

Many risks from potentially hazardous wastes are no greater and no more difficult to assess than many other risks we deal with every day. Highways, hospitals, airplanes, bathtubs and criminals all pose dangers, dangers we cope with successfully all the time. It is wasteful to direct regulatory effort toward trying to lower the risk from hazardous wastes below that of other risks we face. It is wasteful because in pursuing less important hazards we do a less effective job in regulating more important hazards.

THE PRESENT REGULATIONS ARE UNFOCUSED.

The EPA definitions of hazardous wastes are so very comprehensive that they include wastes that are extremely hazardous along with wastes that are of very limited potential hazard. In the area of toxic substances, the regulations apply a variety of tests so as to encompass a wide array of wastes. As a consequence, the volume of wastes defined as hazardous is enormous and the number of plants thus considered as hazardous waste generators numbers in the hundreds of thousands. A very large regulatory effort would be required to give close scrutiny to all the wastes streams included in the definition.

Within the broad class of wastes defined as hazardous, the Agency has not defined relative categories of risk. As a consequence, the Agency has committed itself to equal vigor in pursuing relatively minor risks as well as important ones. Under the regulations, a firm is just as culpable if it spills a little saccharine as if it spreads dioxin by a roadside.

The regulations do establish certain exclusions, but the exclusions reflect administrative convenience rather than relative risk. Several of the exclusions are viewed as temporary as if the Agency will be able to grow so as to be ever more comprehensive. First, all wastes generated by households are excluded regardless of quantity or degree of hazard. Second, wastes generated in small quantities are not subject to the full force of the regulations regardless of their hazard. (The regulations make clear the small quantity exclusion will be reduced in the future.) Third, the enormous quantities of drilling muds and brines and ash from coal fired utilities are

exempt because we have no practical way to deal with them. Note that these exclusions stand regardless of the degree of hazard.

At the same time, the present set of regulations do not make use of important characteristics of wastes that relate to the degree of hazard. For example, a waste material that is diluted is treated just that same as when it is undiluted. A teaspoon full of saccharine mixed in a truckload of distilled water for disposal means that the whole truckload must be treated as though it were all dioxin.

THE FAILURE TO FOCUS THE EFFORT
MEANS THE REGULATION IS LESS EFFECTIVE.

The Agency has defined hundreds of millions of tons of wastes from hundreds of thousands of generators as hazardous. Enforcement personnel will be buried by mountains of paper, much of it dealling with relatively low risk materials. Exactly the same standards are mandated for firms disposing of very dilute solutions of low risk materials as for highly concentrated very high risk wastes.

By using a very broad and undifferentiated definition of hazard, the Agency radically increases the demand for ultra secure disposal facilities. At the same time, the Agency has made it very difficult to develop new disposal facilities by recognizing only one category of disposal facility (and by long delays in creating standards for licensees). As a result the cost of legal disposal has skyrocketed. This has induced more wastes to flow to illegal channels. If present illegal disposal is much less safe than traditional legal disposal, then the regulation may have actually caused harm!

The failure to focus the regulatory effort also creates problems in trying to induce firms to seek alternatives to landfill and deep well injection. Generally, such alternatives are significantly more expensive than even ultra-secure landfill. Nevertheless for some kinds of very hazardous wastes, some extra inducement for incineration or recycling may be appropriate. Unless the regulatory effort is carefully focused, however, it is unlikely to be able to induce much incineration or recycling. If a special category of very high risk wastes were defined, special arrangements for dealing with such wastes might be feasible.

CONGRESS COULD HELP.

The Congress has given no signal that regulatory efforts should be focused on the high risks. The language of the legislation talks about all wastes of hazard or potential hazard. Very few people seriously propose that very high costs should be incurred to reduce the risks from hazardous wastes to far below the level of risks we commonly live with. Yet the language of the legislation and the resulting regulations set the unrealistic goal of achieving complete safety from hazardous wastes. That posture gets in the way of using our limited regulatory capacity to do the most good.

I would propose that legislation recognize highly mutagenic wastes as a special class. Other categories of wastes have effects that are much more limited, much less frightening. Yes, explosive and reactive wastes pose real risks; yes, other kinds of toxicity are quite deadly. Nevertheless, the other kinds of wastes pose risks that are comparable to everyday risks. However, when a waste material poses a high level of mutagenic risk, extra precautions are in order. Exposure to a mutagenic material may not cause observable harm for several generations. Thus, even persons who handle materials routinely may be unaware of their long run effect.

LET'S CONCENTRATE OUR ENERGY.

Our limited regulatory capacity would do us much more good if it were focused on very high risks. We could do a better job of handling extremely hazardous things if regulatory action were limited to this class. Regulatory scrutiny could be more careful. The possibility of inducing more incineration and recycling could be greater if regulation were focused on a narrow category of very hazardous wastes. One possibility is to single out very mutagenic wastes as the central focus of the regulation.

Congress could help by defining the regulatory mission in a way that recognizes degrees of risk and limits regulatory action to risks that exceed levels that we are accustomed to living with every day. Most of our efforts should be focused where they will do the most good. The present legislation attempts to bring absolute safety to all. Such a distant ideal distracts us from the important business of doing the best we can in the present situation.

The Congress and the Agency have exploited the fright value of hazardous wastes. The result is an overly ambitious set of regulations. These regulations cause harm because of the inducement to illegal disposal. These regulations are much less effective than they should be because they are not focused on the things that cause the greatest damage.

Mr. GORE. Thank you very much. We will have questions later. Robert Stoots from the Tennessee Eastman Co. is here from Kingsport representing the Chemical Manufacturers Association, and we are delighted to have you. Please proceed.

Mr. STOOTS. Thank you, Mr. Chairman, members of the subcommittee, ladies, and gentlemen. I am Bob Stoots, coordinator of agency relations in the clean environment program at Tennessee Eastman Co. in Kingsport, Tenn.

Today, I am speaking on behalf of the Chemical Manufacturers Association. CMA is a nonprofit trade association whose company members represent more than 90 percent of the productivity capacity of basic industrial chemicals within the United States. CMA members have a strong interest in assuring that waste management regulations protect health and environment and are costeffective.

CMA supports the objective of a clean environment through responsible management of all wastes. Recognizing that different wastes represent different degrees of risk and difficulty in management, it is important to recognize that suitable alternatives exist for waste management which correspond to characteristics of waste. Protection of health and the environment is the primary concern that should guide selection of these alternatives for responsible waste management.

CMA recognizes the diverse nature of solid and hazardous wastes and believes that certain wastes require special handling. From a broad prospective, the chemical industry in general practices waste management in the following way: The chemical industry's priorities are to reduce waste generation and to reuse or recycle byproducts. This is sound business practice because our companies cut production costs by conserving valuable product, reducing the amount of waste disposed, and recovering fuel value as well as other useful products from byproduct materials. Another approach is treatment to mitigate the hazardous nature of a waste or to further reduce the quantity of the waste to be handled.

Finally, despite emphasis on finding alternatives to landfilling, some wastes must be landfilled.

CMA believes that any incentive plan should be designed to encourage application of the most responsible waste management practices. Those companies making the most use of waste elimination, recycle, reuse, and treatment, should realize the greatest rewards from economic incentives.

The present regulatory scheme provided by the Resource Conservation and Recovery Act encourages the elimination of hazardous waste generation by increasing the cost of disposal via more restrictive design and operating standards for disposal. Because RCRA is a very comprehensive law that has extensive implementing regulations, a company can best minimize its costs of complying with RCRA by eliminating or reducing the quantity of hazardous waste generated. This may be established in several ways, including material substitutions, process changes, and recovering the value of byproducts. For many production processes, certain options are available in selecting raw materials and catalysts. By making the proper substitution, byproduct streams may no longer exhibit hazardous characteristics. Process changes may involve modification of

the process chemically so that selected waste materials are avoided. Changes may also involve modification of equipment operating conditions or selection of raw materials so that the hazardous nature and/or the amount of waste generated can be minimized.

The chemical industry is a leader in recycle and reuse of byproducts. For example, many organic chemical operations can and do use solvent recovery techniques. Considerable capital investment is necessary to build solvent recovery facilities, but in some instances raw material cost savings are often achievable through collection, separation, recovery, and reuse of those standard solvents. Therefore, some economic incentives already do exist for making process yield improvements to reduce solvent usage and for recovery equipment to reduce solvent losses.

Offsite solvent recovery is another available treatment alternative. Many of those materials with positive heat value which cannot be reused in chemical processing may be handled effectively in energy recovery units that produce steam or power for sale or for inplant consumption. In this era of increased fuel costs, materials with positive fuel value are frequently used to substitute or supplement conventional fuels. Based upon early results from EPA tests on burning practices in industrial boilers, these practices will be shown fully protective of human health and the environment.

Although waste minimization, recycle and reuse practices represent, from CMA's perspective, one of the most important ways to reduce the potential for hazardous waste problems, not all wastes can be handled this way. Chemical, physical, biological, or thermal treatment methods are used where practicable to change the characteristics of the waste and the waste volume. Certain waste can be effectively neutralized chemically to eliminate or moderate its corrosivity, reactivity, or toxicity; thus reducing the potential risk to health or the environment. For some processes, physical separation techniques are effective in reducing the quantities of materials before they become wastes. Many waterborne hazardous wastes can be readily digested in biological treatment systems.

Over one-half the hazardous waste incinerators operated in this country are within the chemical industry. Most of those were installed prior to RCRA and were a considerable voluntary investment in capital and operating cost when less expensive disposal methods were available. Incinerators destroy hazardous organic wastes by converting them to carbon dioxide and water. The RCRA standards for hazardous waste incinerators require 99.99 percent destruction and removal efficiency.

Despite the emphasis on finding alternatives to landfilling, some wastes must be landfilled. Even as advanced methods of waste treatment become widely available, these facilities will unavoidably create residues that will have to be disposed in the land.

Moreover, it is not practicable to incinerate certain primarily inorganic wastes that do not burn. Consequently, landfilling of some wastes will continue to be necessary and appropriate.

With regard to the need for amendment of the Resource Conservation and Recovery Act, CMA is concerned that extensive legislative changes could hamper expeditious implementation of the program that EPA has developed over the last several years.

Furthermore, we would recommend against adopting any changes which would discourage the legitimate reuse and recycle by industry, particularly in the area of burning byproduct fuels for energy recovery.

Mr. GORE. Excuse me. If I may interrupt you there.

Mr. STOOTS. Yes.

Mr. GORE. One of the changes that has been proposed is a design to prevent the mixing of hazardous chemical wastes into fuel oil so that it burns in fuel oil. Are you meaning to oppose the closing of that loophole with that statement?

Mr. STOOTS. We believe that byproduct materials that have positive heat value can be used to substitute or supplement fuels in industrial boilers that operate at high temperatures and would have high destruction efficiency.

Mr. GORE. I will come back to it. Excuse me for interrupting. Go ahead.

Mr. STOOTS. We find that some legislative initiatives contained in the last year's H.R. 6307, are timely and constructive. In particular, CMA does support a land disposal ban as outlined in H.R. 6307 and as approved by the House of Representatives last year.

CMA supports prohibitions against continued landfill of those hazardous wastes which present unreasonable risks when landfilled and for which more protective, practicable alternatives do exist. We are aware that EPA is already working toward this and several States, most notably California, have already moved in that direction.

If potential threats to health and the environment are identified from continued land disposal of certain wastes, their land disposal should be restricted at the earliest possible time. However, imposing restrictions before alternative methods in sufficient capacity are available would also endanger health and the environment. Such action could result in the storage of large quantities of hazardous waste without adequate facilities.

Any program should provide an orderly shift away from disposal methods which are not adequately protective to a more appropriate program using available and practicable technology. We suggest that the schedule for any prohibitions take into account the availability of alternative disposal capacity on both a national and case-by-case basis.

It is very difficult to compare costs necessary to achieve a given level of control of waste treatment and waste disposal. This is because the costs are most dependent on particular types of wastes. However, we can conclude that landfill costs have increased significantly and will continue to increase, thereby making alternate treatment technologies and recycle and reuse more economically competitive.

In addition, the free enterprise system provides fundamental economic incentives for high yield, high productivity, lower cost operations. The system itself encourages initiatives to minimize waste generation and maximize recycle and reuse. However, the funding mechanism under the present Comprehensive Environmental Response Compensation and Liability Act or commonly known as Superfund does not provide incentive to reduce waste. If the present tax on petrochemical feedstocks for the cleanup of disposal sites

were changed to a waste disposal tax, the desired incentives could be provided. Such a tax, collected on hazardous waste disposal, would further motivate waste generators away from landfilling to other, more appropriate technologies. There is little correlation between quantities of raw material consumed and quantities of hazardous waste disposed.

The front-end tax does not act as an incentive to minimize waste disposed. CMA believes that if Superfund is reopened, taxes based on petrochemical feedstocks should be removed and the entire funding mechanism should be based on the quantities of hazardous waste disposed.

So, in conclusion, CMA encourages all reasonable measures to minimize the generation and disposal of hazardous wastes, recognizing that waste generation cannot be totally eliminated, CMA supports the continued development and use of alternative waste management techniques that adequately protect health and the environment.

Finally, we should endeavor to decrease our dependence on landfills wherever feasible.

Thank you.

[The prepared statement of Mr. Stoots follows:]

CHEMICAL MANUFACTURERS ASSOCIATION

STATEMENT OF

ROBERT L. STOOTS

OF TENNESSEE EASTMAN COMPANY

ON BEHALF OF THE

CHEMICAL MANUFACTURERS ASSOCIATION

BEFORE THE

SUBCOMMITTEE ON INVESTIGATION AND OVERSIGHT

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

ALTERNATIVE TECHNOLOGIES FOR THE
DISPOSAL OF HAZARDOUS WASTE

FEDERAL BUILDING
JACKSON, TENNESSEE

March 30, 1983

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Good afternoon, Mr. Chairman, members of the Subcommittee, ladies and gentlemen. I am Robert L. Stoots, Jr., Coordinator of Agency Relations, in the Clean Environment Program, at Tennessee Eastman Company located in Kingsport, Tennessee. Today, I am speaking on behalf of the Chemical Manufacturers Association (CMA). CMA is a nonprofit trade association whose company members represent more than 90% of the productive capacity of basic industrial chemicals within this country. CMA's members have a strong interest in assuring that treatment and disposal regulations are cost effective and protect health and the environment.

CMA supports the objective of a clean environment through responsible management of all wastes. Recognizing that different wastes represent different degrees of risk and difficulty in management, it is important that suitable alternatives exist for waste management which correspond to the characteristics of waste. Protection of health and the environment is the primary concern that should guide selection of these alternatives for responsible waste management.

CMA recognizes the diverse nature of solid and hazardous wastes and believes that certain wastes require special handling. From a broad perspective, the chemical industry in general practices waste management in the following way: The chemical industry's priorities are to reduce waste generation

and to reuse or recycle by-products. This is sound business practice because our companies cut production costs by conserving valuable product, reducing the amount of waste disposed, and recovering fuel value as well as other useful products from by-product materials. Another approach is treatment to mitigate the hazardous nature of a waste or to further reduce the quantity of waste to be handled. Finally, despite an increased emphasis on finding alternatives to landfilling, some wastes must be landfilled.

CMA believes that any incentive plan should be designed to encourage application of the most responsible waste management practices. Those companies making the most use of waste elimination, recycle, reuse, and treatment options should realize the greatest reward through economic incentives.

Waste Management Options

The present regulatory scheme provided by the Resource Conservation and Recovery Act (RCRA), encourages the elimination of hazardous waste generation by increasing the cost of disposal via more restrictive design and operating standards for disposal. Because RCRA is a very comprehensive law that has extensive implementing regulations a company can best minimize its costs of complying with RCRA by eliminating or reducing the quantity of hazardous waste generated. This may be accomplished in several ways, including material substitutions

PROCESS CHANGES, AND RECOVERING THE VALUE OF BY-PRODUCT MATERIALS. FOR MANY PRODUCTION PROCESSES, CERTAIN OPTIONS ARE AVAILABLE IN SELECTING RAW MATERIALS AND CATALYSTS. BY MAKING THE PROPER SUBSTITUTION, BY-PRODUCT STREAMS MAY NO LONGER EXHIBIT HAZARDOUS CHARACTERISTICS. PROCESS CHANGES MAY INVOLVE MODIFICATION OF THE PROCESS CHEMISTRY SO THAT SELECTED WASTE MATERIALS ARE AVOIDED. CHANGES MAY ALSO INVOLVE MODIFICATION OF EQUIPMENT OPERATING CONDITIONS OR SELECTION OF RAW MATERIALS SO THAT THE HAZARDOUS NATURE AND/OR AMOUNT OF WASTE GENERATED IS MINIMIZED.

THE CHEMICAL INDUSTRY IS A LEADER IN RECYCLE AND REUSE OF BY-PRODUCTS. FOR EXAMPLE, MANY ORGANIC CHEMICAL OPERATIONS CAN AND DO USE SOLVENT RECOVERY TECHNIQUES. CONSIDERABLE CAPITAL INVESTMENT IS NECESSARY TO BUILD SOLVENT RECOVERY FACILITIES, BUT IN SOME INSTANCES RAW MATERIAL COST SAVINGS ARE ACHIEVABLE THROUGH COLLECTION, SEPARATION, RECOVERY AND REUSE OF STANDARD SOLVENTS. THEREFORE, SOME ECONOMIC INCENTIVES ALREADY EXIST FOR MAKING PROCESS YIELD IMPROVEMENTS TO REDUCE SOLVENT USAGE AND FOR ADDING RECOVERY EQUIPMENT TO REDUCE SOLVENT LOSSES. OFF-SITE SOLVENT RECOVERY IS ANOTHER AVAILABLE TREATMENT ALTERNATIVE. MANY OF THOSE MATERIALS WITH POSITIVE HEAT VALUE WHICH CANNOT BE REUSED IN CHEMICAL PROCESSING MAY BE HANDLED EFFECTIVELY IN ENERGY RECOVERY UNITS WHICH PRODUCE STEAM OR POWER FOR SALE OR FOR IN-PLANT CONSUMPTION. IN THIS ERA OF INCREASED FUEL COSTS,

MATERIALS WITH POSITIVE FUEL VALUE ARE FREQUENTLY USED TO SUBSTITUTE OR SUPPLEMENT CONVENTIONAL FUELS. BASED UPON EARLY RESULTS FROM EPA TESTS ON BURNING PRACTICES IN INDUSTRIAL BOILERS, THESE PRACTICES WILL BE SHOWN FULLY PROTECTIVE OF HEALTH AND THE ENVIRONMENT.

ALTHOUGH WASTE MINIMIZATION, RECYCLE AND REUSE PRACTICES REPRESENT, FROM CMA'S PERSPECTIVE, ONE OF THE MOST IMPORTANT WAYS TO REDUCE POTENTIAL FOR HAZARDOUS WASTE PROBLEMS, NOT ALL WASTES CAN BE HANDLED THIS WAY. CHEMICAL, PHYSICAL, BIOLOGICAL AND THERMAL TREATMENT METHODS ARE USED WHERE PRACTICABLE TO CHANGE THE CHARACTERISTICS OF THE WASTE AND REDUCE WASTE VOLUME. CERTAIN WASTE CAN BE EFFECTIVELY NEUTRALIZED CHEMICALLY TO ELIMINATE OR MODERATE ITS CORROSIVITY, REACTIVITY OR TOXICITY; THUS REDUCING THE POTENTIAL RISK TO HEALTH OR THE ENVIRONMENT. FOR SOME PROCESSES, PHYSICAL SEPARATION TECHNIQUES ARE EFFECTIVE IN REDUCING THE QUANTITIES OF MATERIALS BEFORE THEY BECOME WASTES. MANY WATERBORNE HAZARDOUS WASTES CAN BE READILY DIGESTED IN BIOLOGICAL TREATMENT SYSTEMS.

OVER ONE HALF THE HAZARDOUS WASTE INCINERATORS OPERATED IN THIS COUNTRY ARE WITHIN THE CHEMICAL INDUSTRY. MOST OF THOSE WERE INSTALLED PRIOR TO RCRA AND WERE A CONSIDERABLE VOLUNTARY INVESTMENT IN CAPITAL AND OPERATING COST WHEN LESS EXPENSIVE DISPOSAL METHODS WERE AVAILABLE. INCINERATORS DESTROY HAZARDOUS WASTES BY REDUCING THEM TO CARBON DIOXIDE AND WATER.

RCRA standards for hazardous waste incinerators require 99.99% destruction efficiency. This method destroys hazardous waste characteristics and reduces the quantity of waste.

Despite emphasis on finding alternatives to landfilling, some wastes must be landfilled. Even as advanced methods of waste treatment become widely available, these facilities will unavoidably create residues that will have to be disposed in the land (inorganic sludges and incinerator ash fall in this category). Moreover, it is not practicable to attempt to incinerate certain primarily inorganic wastes that do not burn. Consequently, landfilling of some wastes will continue to be necessary and appropriate.

Constructive Legislative Change

With regard to the need for amendment of the Resource Conservation and Recovery Act, CMA is concerned that extensive legislative changes could hamper expeditious implementation of the program EPA has developed over the last several years. Furthermore, we would recommend against adopting any change which would discourage legitimate reuse and recycle by industry, particularly in the area of burning by-product fuels for energy recovery. However, we find that some of the legislative initiatives contained in the 1982 Bill, H.R. 6307, are timely and constructive. In particular, CMA supports the land disposal ban as outlined in H.R. 6307 as passed by the U.S. House of Representatives last year.

CMA SUPPORTS PROHIBITIONS AGAINST CONTINUED LANDFILL OF THOSE HAZARDOUS WASTES WHICH PRESENT UNREASONABLE RISKS WHEN LANDFILLED AND FOR WHICH A MORE PROTECTIVE, PRACTICABLE ALTERNATIVE EXISTS. WE ARE AWARE THAT EPA IS ALREADY WORKING TOWARD IDENTIFYING THOSE SUBSTANCES, AND SEVERAL STATES, MOST NOTABLY CALIFORNIA, HAVE MOVED IN THAT DIRECTION.

IF POTENTIAL THREATS TO HEALTH AND THE ENVIRONMENT ARE IDENTIFIED FROM CONTINUED LAND DISPOSAL OF CERTAIN WASTES, THEIR LAND DISPOSAL SHOULD BE RESTRICTED AT THE EARLIEST POSSIBLE TIME. HOWEVER, IMPOSING RESTRICTIONS BEFORE ALTERNATIVE METHODS ARE AVAILABLE IN SUFFICIENT CAPACITY WOULD ALSO ENDANGER HEALTH AND THE ENVIRONMENT BY REQUIRING STORAGE OF LARGE QUANTITIES OF HAZARDOUS WASTE WHERE ADEQUATE STORAGE FACILITIES ARE NOT AVAILABLE.

HOWEVER, A PROGRAM WHICH PROVIDES AN ORDERLY SHIFT AWAY FROM DISPOSAL METHODS WHICH ARE NOT ADEQUATELY PROTECTIVE TO A MORE APPROPRIATE PROGRAM USING AVAILABLE AND PRACTICABLE TECHNOLOGY, IS CERTAINLY RESPONSIBLE. WE SUGGEST THAT THE SCHEDULE FOR ANY PROHIBITIONS TAKE INTO ACCOUNT THE AVAILABILITY OF ALTERNATIVE DISPOSAL CAPACITY ON BOTH A NATIONAL AND CASE-BY-CASE BASIS.

ECONOMIC INCENTIVES FOR WASTE MANAGEMENT ALTERNATIVES

IT IS VERY DIFFICULT TO COMPARE COSTS NECESSARY TO ACHIEVE A GIVEN LEVEL OF CONTROL OF WASTE TREATMENT AND WASTE DISPOSAL. THIS IS BECAUSE THE COSTS ARE MOST DEPENDENT ON WASTE TYPE. HOWEVER, WE CAN CONCLUDE THAT LANDFILL COSTS HAVE INCREASED SIGNFICIANTLY AND WILL CONTINUE TO INCREASE, THEREBY MAKING ALTERNATE TREATMENT TECHNOLOGIES AND RECYCLE AND REUSE MORE ECONOMICALLY COMPETITIVE.

IN ADDITION, THE FREE ENTERPRISE SYSTEM PROVIDES FUNDAMENTAL ECONOMIC INCENTIVES FOR HIGH YIELD, HIGH PRODUCTIVITY, LOWER COST OPERATIONS. THE SYSTEM ITSELF ENCOURAGES INITIATIVES TO MINIMIZE WASTE GENERATION AND MAXIMIZE RECYCLE AND REUSE. HOWEVER, THE FUNDING MECHANISM UNDER THE PRESENT COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (SUPERFUND) DOES NOT PROVIDE INCENTIVES TO REDUCE WASTE. IF THE PRESENT TAX ON PETROCHEMICAL FEEDSTOCKS FOR CLEANUP OF DISPOSAL SITES WERE CHANGED TO A WASTE DISPOSAL TAX, THE DESIRED INCENTIVES COULD BE PROVIDED. SUCH A TAX, COLLECTED ON HAZARDOUS WASTE DISPOSAL WOULD FURTHER MOTIVATE WASTE GENERATORS AWAY FROM LANDFILLING TO OTHER, POSSIBLY MORE APPROPRIATE, TECHNOLOGIES. THERE IS LITTLE CORRELATION BETWEEN QUANTITIES OF RAW MATERIAL CONSUMED AND QUANTITIES OF HAZARDOUS WASTE DISPOSED. THE "FRONT-END" TAX DOES NOT ACT AS AN INCENTIVE FOR THE GENERATOR WHO IS SPENDING MONEY TO EMPLOY RECYCLE AND REUSE METHODS TO MINIMIZE WASTE DISPOSED. CMA BELIEVES THAT IF SUPERFUND IS REOPENED, TAXES BASED ON

PETROCHEMICAL FEEDSTOCKS SHOULD BE REMOVED AND THE ENTIRE FUNDING MECHANISM SHOULD BE BASED ON THE QUANTITIES OF HAZARDOUS WASTE DISPOSED.

CONCLUSION

CMA ENCOURAGES ALL REASONABLE MEASURES TO MINIMIZE THE GENERATION AND DISPOSAL OF HAZARDOUS WASTES. RECOGNIZING THAT WASTE GENERATION CANNOT BE TOTALLY ELIMINATED, CMA SUPPORTS THE CONTINUED DEVELOPMENT AND USE OF ALTERNATIVE WASTE MANAGEMENT TECHNIQUES THAT ADEQUATELY PROTECT HEALTH AND THE ENVIRONMENT. FINALLY, WE SHOULD ENDEAVOR TO DECREASE OUR DEPENDENCE ON LANDFILLS WHERE FEASIBLE.

Mr. GORE. Thank you. That was the best statement I have ever heard from CMA. Thank you. I really appreciate it very much. I appreciate it partly because you supported the idea that I am going to be sponsoring in the way of legislation to change the nature of the fee structure. I think that is a very responsible position on the part of CMA. And your support will certainly make it a lot more likely that this bill will pass in Congress. But I will come back to that in questions.

Mr. Cook, Deputy Director of the Office of Solid Waste, Environmental Protection Agency, we are delighted to have you here and we invite you to proceed.

Mr. COOK. Thank you very much, Mr. Chairman.

I consider it a great honor to participate in this excellent discussion of fundamental issues of policy and technology in the program. I want to compliment you in putting together a most interesting program.

What I propose to do is actually to largely ignore my prepared text and comment on a number of issues that I think have not been properly dealt with or with which I might want to add some remarks, if that is all right with you.

What I want to start with is to get some perspective on what is happening. We all seem to be talking about where the program ought to be going and there has been very little mention of where it has been.

The program really got under way with its first regulations put out in 1980 just 3 years ago, not even 3 years ago, which incidentally was the same year that the Superfund law was enacted.

We have since come out with a new set of regulations, current practices, improving upon those practices, so that they are protective of human health and the environment. That seemed to be our principal mission. And my understanding of the act, I think, that

was the intent of Congress and that certainly was what we focused on in our endeavor.

What we are seeing today is an emerging belief on the part of a substantial number of the interested parties that we should actually tend to see change in that approach, and that what we should do is ban a substantial set of practices or at least partially restrict those practices to a much greater degree than was ever contemplated under the law.

Incidentally, something with which we would agree, as I would note a little later in my testimony, is encourage a number of alternatives which, though they have been practiced in some ways and some places at some times, probably not widely practiced, are utilized for only a small percentage of wastes, and at the same time develop some additional technology that may be only bench scale or in the development stages or have not been economically feasible.

As I noted, this is a major change. And to give you some sense of how major this is, there has been mentioned here about State programs that ban hazardous waste disposal. I think I am correct. If I am off by one or two States, I might be, but I think I am correct in stating that there is no State that currently has in effect now a ban on any wastes that go beyond Federal bans that currently exist for selective wastes in landfills.

California has bans which will go into effect in the coming years, and Illinois has a ban that will go into effect in 1987. It turns out that Rhode Island does have a ban in effect now, but they have no hazardous waste land disposal facilities. And not having any land disposal facilities, it is easy to ban the hazardous wastes, obviously.

Mr. GORE. They do not have any land there, either, do they?

Mr. COOK. That is right.

This major change in attitude, I think, has come about for a number of reasons; the public interest has come from the damage cases emerging that also led to the enactment of Superfund. Some additional research has been done. For example, our own research that we sponsored which shows that, under certain circumstances, clay liners do not at all contain wastes. In fact, certain kinds of organic wastes actually interact with the clay in such a way that they form a passive waste that actually moves through the clay liners in a subtle fashion.

Mr. GORE. Like Draino.

Mr. COOK. Yes. I have heard that somewhere before.

I think we should keep in mind this perspective, that this whole discussion today is really not on the leading edge of thinking and it is not something that is totally shared by everyone involved.

We just put out our land disposal regulations which were broadly criticized today. I did not hear a single criticism that we did not make for ourselves a preamble to those regulations. You could have had all the testimony today just by citing criticisms of our own regulations that we cited in the preamble.

Mr. GORE. Why did you go forward after the preamble?

Mr. COOK. We did the very best we could in coming out with regulations which we thought were fundamentally protecting the human health and environment.

Mr. GORE. I see.

Mr. Cook. But we conceded that there were some additional areas which I will mention later on having to do with regulations and some other kinds of problems.

On the first day that it was possible, we had 20 parties file in court on those regulations. Incidentally, every single regulation we have put out has been litigated. And a substantial number of the parties that filed—there are over 150 counts, issues—and a substantial number of the issues are in opposition on the grounds that our regulations are too stringent, too demanding and unnecessarily protective.

Now, the consequence of regulations that we have put in place as has been observed today, is a substantial increase in our costs of managing wastes across the board. This is true and includes the cost of land disposal, which cost is not as nearly as important as it will be as more and more of the regulations are fully implemented.

Despite the fact that they have not been completely felt, there is clearly major change going on in the way the industry handles its wastes.

We have a great deal of evidence—I have spoken to many, many members of the industrial community and folks in the solid waste, the Hazardous Waste Management Committee, who all agree unanimously there is a lot more recycling going on, a lot more waste reduction going on, major process changes where people are eliminating hazardous constituents from their wastes with an eye—from the processes so that they won't appear in their waste. And I wish that I could quantify these changes for you. We will have some quantification in the next few months.

We have done a major survey of waste generators and those who are treating, storing, and deposing wastes, those data have been entered in our data file and we are just beginning to analyze them now. What we have found is that during the period of 1980–82 we went from one-third to two-thirds of generators, treaters, storers, disposals saying that they were recycling or reusing where previously they had not been doing so.

There is double, basically, of the number of these folks who are now undertaking this kind of practice.

I would like to just mention some of the key elements in our regulations.

We now estimate that there are about 20,000 generators of hazardous wastes that are regulated under our program. And they are now required to identify their wastes, insure that they are sent to an improved hazardous waste management facility, required to maintain records on the amounts, types and ultimate disposition of these materials. Transporters are required to comply with their manifest system of shipments.

We have roughly 10,000 active hazardous waste treatment storage and disposal facilities under interim regulatory standards. We are beginning to issue permits to these treatment storage and disposal facilities with detailed regulatory standards.

The important point I want to emphasize not mentioned here today, we have authorized 36 States on an interim basis, to operate parts of the RCRA program. These States, and I have been out visiting them, these States have adopted new laws and regulations, reorganized, hired, and trained new staff and greatly expanded the

focus and interest at the State level in managing hazardous waste, all in the same period of less than 3 years. For a student of institutional bureaucracy and politics, this is an absolutely remarkable state of affairs, and probably unparalleled in the history of State government.

To determine if the regulated facilities are meeting the interim status requirement, many of the States since 1980 have made 26,000 inspections of these facilities. EPA has issued compliance orders to 500 facilities with penalties in appropriate cases, and referred several civil and criminal actions to the Department of Justice for violation of RCRA regulations.

In addition, the States have also taken quite a number of enforcement actions.

I would like to turn for a moment to the land disposal regulations, the ones that have been discussed to a substantial degree today, and mention some of the principal elements in those regulations. They required state-of-the-art technologies including highly protective synthetic liners, leachate collection systems, and final covers.

We prohibit from land disposal most ignitable and reactive wastes. These are the wastes, incidentally that we were told earlier might be allowed to go into land disposal facilities. We already prohibit them. We prohibit them or restrict them because of the dangers of putting ignitable wastes into the land disposal environment and the dangers of including active wastes into that kind of environment.

We also prohibit disposal of waste material being incompatible with other wastes or with liner systems.

We prohibit disposal of containers holding free standing liquids.

We require proof of financial ability to close the facility properly and monitor and maintain it for 30 years after closure.

We require liability insurance, both sudden and nonsudden incidents associated with the facility.

We require a ground water monitoring system.

The last point and I would emphasize this, we require of all active facilities that if any ground water contamination is found they must clean it up. They must clean up that contamination.

We will issue detailed permits to each of the estimated 1,600 land disposal facilities based on these standards. This permitting process is now well under way.

Mr. GORE. May I interrupt you just briefly? These regulations which you listed here, do they apply to all landfill in the country?

Mr. COOK. They apply to all landfills, all new landfills. Certain of these requirements apply to existing landfills, the liner requirements, leachate collection requirements and some aspects of the cover requirements do not apply to existing landfills.

We are currently considering the regulation that would apply to existing ones.

Mr. GORE. Most of them apply to new landfills as of—new landfills opened as of what date?

Mr. COOK. As of the date they open. A new landfill to open now must get a permit from EPA and it would be applied the day they open.

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Mr. GORE. But all the existing landfills are exempt from certain of these requirements, is that right?

Mr. COOK. That is right. As I say, we are in the process now of preparing a regulation that would extend all of these requirements to new units of existing landfills.

Mr. GORE. But not to existing landfills?

Mr. COOK. Well, in a sense.

Let me explain how an existing landfill normally operates. The way they normally operate is by putting a trench, filling it up, covering it and then opening a new trench, filling that up and covering it and so on. And they move progressively along these lines. And what we are preparing now is a regulation that would apply to the new units of these existing landfills.

Meanwhile, though, I would emphasize that the ground water protection standard that I mentioned does apply to all existing landfills without exception right now. If they are found to be contaminating ground water they must clean it up.

Mr. GORE. Is it technically feasible to remove the ground water contamination after it occurs?

Mr. COOK. Yes. We have a fair amount of experience in doing that. There are perhaps some circumstances in which you cannot remove all the contamination to the degree which our regulations require. That is an issue that has been raised by the litigants and do expect to be discussing the matter and taking into account the detriments if we don't modify regulations to allow something like in-place fixation——

Mr. GORE. Now, let's take a specific example. You are familiar with Hardeman County, Tenn., landfill. It is not too far from here. There are 1 thousand acres of underground water resources contaminated there, if my information is correct. I take it that this means you will require the removal of all that ground water contamination?

Mr. COOK. As I understand it, that is an abandoned hazardous waste site, not an active hazardous waste site. Our requirement applies to the active hazardous waste sites. Superfund and the requirements of the national contingency plan apply to the uncontrolled abandoned sites.

Mr. GORE. As soon as they stop using it, then they don't have to remove the ground water contamination?

Mr. COOK. No sir. If they used it on or after January 26, 1983, January 26 of this year, they are subject to the ground water monitoring requirements. It is a matter of when they quit using it.

Mr. GORE. What if they are not financially capable of cleaning up the ground water? It is very expensive, is it not?

Mr. COOK. It can be.

Mr. GORE. Yes. What if they are not financially capable of cleaning up the ground water?

Mr. COOK. We, under those circumstances, will have to do whatever we can through court ordered enforcement action to obtain as much of the cost as possible, and if that still is not sufficient, we will have to turn to the authorities of Superfund.

Mr. GORE. What kind of inspection and monitoring program do you have to make certain that these requirements are being complied with?

Mr. Cook. As I mentioned, we have since 1980 done 26,000 inspections of facilities, and these include the land disposals. At least we have a requirement right now that EPA or the States visit every single facility subject to our ground water monitoring requirements at least once a year. We are supplementing that in the guidance for 1984 by requiring very, very detailed studies of the adequacy of the ground water monitoring system.

Mr. Gore. Now, in the 36 States that have been authorized to operate part of the RCRA program, are they conducting those inspections?

Mr. Cook. Yes, sir. Indeed, even in the States that are not authorized, the States are often conducting inspections on behalf of the EPA. They are using procedures that have been agreed to by EPA. We are spot checking the quality of those inspections. Actually, I've accompanied them on some of the inspections, as well.

Mr. Gore. OK. Excuse me for interrupting. Go ahead.

Mr. Cook. I wanted to briefly discuss alternatives to land disposal. They have, of course, received a great deal of discussion.

I would like to mention that we have, of course, focused principally on regulations of existing hazardous waste practices. We have investigated and to a limited extent promoted alternatives to land disposal.

And in this regard, I wanted to mention that studies that we have done in alternative technologies indicate that for many, many, if not most, of the waste treatment—of the wastes that are being generated, you really have to tailor technologies to the specific waste. Or you have to put together a so-called train, process train, of different technologies, and you have to tailor that process to the specific waste. And the cost of treatment of these wastes tends to vary tremendously from process to process or the process train to process train. I think there is—I have gotten the feeling from the discussions today that somehow treatment has one cost, and incineration has another cost, and if you just work out the costs somehow we will understand everything with a few numbers. And that's just not true.

We are saying—I am saying, based on these studies, that virtually every single waste treatment, which there are thousands, probably would appropriately have its own tailored technology, its own tailored process train, and the costs of that technology and the process train would be different for every waste treatment.

Furthermore, we found from our studies that quite a number of these processes or technologies are in use. There is a further number which are in partial use, which seem to be quite cost effective from an economic point of view, which raises the obvious question, why the industry doesn't adopt them industrywide. And still other technologies, though available and understood, are not being used.

In that situation I think it is normally because there are just not the economic incentives. Some of the costs—I was looking through some of the cost differentials and the cost differential between land disposal and some of these treatment processes was sometimes as much as two orders of magnitude, which in the current economic environment is pretty substantial.

Turning to research on alternative technologies, the principal focus of our program there, like our regulatory activities, have been helping us to prepare regulations. This research, I think, is having an ancillary benefit of advancing the state-of-art and understanding these technologies for people in the private sector who might want to use them.

We have looked at alternative technologies and spent a lot of money on incineration. We have also looked at the use of microorganisms to transform or fix hazardous waste, various kinds of unusual thermal destruction techniques, and different approaches to waste fixation. We have budgeted for these activities about $10 million in fiscal year 1982, $8.3 million in fiscal year 1983, and under the current EPA budget which is under reconsideration we plan about $7 million for 1984.

Finally, something I think that is of special interest to you who worked so hard on the Superfund bill, we have expended considerable amounts of money in developing equipment to deal with uncontrolled waste sites and hazardous waste spill incidents. Technologies developed include our mobil incinerator, an activated carbon treatment unit, a variety of containment and control devices for spills on the water. And we have budgeted about $13½ million for these activities over the last 3 years.

I mentioned earlier that we plan new restrictions on land disposal and I would like to summarize those. We expect to restrict or ban disposal of bulk liquids in the landfills. Actually it is a practice that is not very widespread. Already it is quite restrictive, but we will further restrict it. We expect to regulate air emissions from land disposal facilities, and as I mentioned, require lateral expansions for the new units of existing facilities to meet the liner leachate collection system requirements.

And we are considering a ban on highly mobile toxic persistent and bioaccumulative wastes from land disposal altogether. We will explore the availability of alternate management technologies for these wastes as well as their costs and environmental impacts. On the basis of these considerations, we do intend to come up with additional waste prohibitions.

In conclusion, I think this is fundamental because it is in line with many things that have been said before, the agency is in favor of discouraging land disposal of wastes that we are uncertain will be contained properly in the very long term. We will encourage alternatives to land disposal whenever prcticable and protective of the environment.

In that relation, I wanted to say a few things about the waste-end tax, which is, I think, agreed by others here to be one way to help discourage land disposal or encourage alternatives. And indeed, I think it could effectively play that role. I just wanted to enter a few reservations to the general enthusiasm.

We are required by the Superfund Act to study the tax mechanism and how it works and how it relates to damage cases that have occurred after Superfund and provide Congress with that report in December 1984.

So on the current track, if it continues, you would be getting the advice of EPA on this sort of thing in 1½ years, a little more than 1½ years from now.

The comments that I had here are obviously not official comments in the sense of being blessed by the study or of the administration or the agency. But they do come out of the experience that we had when we were working on the original Superfund tax and some of the experience that we have had with the RCRA program since then.

First of all, I think any tax that is substantial enough, and it would have to be very substantial to divert wastes from land disposal into other kinds of treatment activities, is at the same time likely to encourage midnight dumping. Unfortunately, we are seeing or have a sense that midnight dumping might be a little bit on the upswing now. There is a reasonable possibility that that would be increased if a very high tax were levied.

The Superfund tax, according to the IRS, is now being paid by less than 1,000 companies, less than 1,000 payees.

If the tax were imposed on waste generators, under the current RCRA regulation, that would probably go to about 20,000 parties. If small generators were brought under the umbrella of RCRA and therefore a new tax, that could increase to 100,000 or several hundred thousand depending on how many small generators were brought under this umbrella.

We Americans are, I think, exceptionally good at paying our taxes. But I think that there are some complexities involved and implied with the kind of tax that we are involved with here that would make it very difficult, especially for some of the small generators involved, to calculate accurately their tax. And we might see inadvertent tax evasion on a broader scale than is typical if we try to impose this kind of tax.

Furthermore, there is a widespread feeling that if we have a tax, it ought to be based on the degree of hazard, that is the tax ought to be higher for the more hazardous waste and lower for less hazardous waste. We seem to have a lot of people who support that idea. I guarantee that for everyone who says it is a good idea to have a degree of hazard, we had 50 people who would disagree over what "degree of hazard" means in practice when it is actually applied to specific wastes.

For example, how do you balance the relative importance of a carcinogen versus a mutagen or a corrosive waste versus an ignitable waste? How do you come up with the language? It is an extraordinarily difficult process. I would mention here as a digression that we do have, to some degree, a degree-of-hazard concept already in our regulations. This has not been recognized today, but we do have the category of waste called acutely hazardous waste. They are regulated right down to generators that generate one kilogram per month.

We also, as I mentioned earlier, ban a lot of wastes from land disposal and that is a kind of degree-of-hazard activity. And our regulations, if you read them carefully, actually are fraught—well, from the point of view of those who try to understand them, are fraught with this kind of degree-of-hazard tailoring.

There is also suggested that we make a distinction between onsite and offsite disposal, that we make a distinction by the type of the management practice, that we make a distinction by recycling versus other kinds of waste management and so on.

What I think is implied in the difficulty and complexity of all this is some fundamental question of equity and policy that will be extraordinarily difficult to resolve, no matter who does it.

One of the beauties of the Superfund tax was that those questions which also existed for the Superfund tax were resolved by the Congress. And the tax was laid right out. There have been a few minor questions of implementation and practice, but the Superfund bill itself laid out all the tax and settled all these questions that have to do with policy right in the law.

If you can do that in Congress for waste end tax, so much the better. I wish you the very best. But it will be extraordinarily difficult because of the kinds of considerations that I have laid out here.

If you flip it to EPA to do, we will have an extraordinarily difficult time, because typically, these questions of equity and fundamental policy and so on are as much political questions in the end as they are technical questions best left to the administrative arm of the Government.

So that either way, I think there are likely to be difficulties. I would suggest that it is going to be a time consuming process, by the way, and I believe Congress will have to wrestle with it over quite a period of time if they actually specify the tax—or EPA, I think, will have to wrestle with it over quite a period of time. And I think that would be measured in years, 2 or 3 years or more.

And just a closing note in that regard. Though our information base is far, far better than it was in 1979 and 1980 when we were first considering the Superfund tax, it still is very poor as a basis for telling you what various alternatives will mean for the taxed community for estimating tax revenues and things of that kind. And in fact, I don't anticipate that our data base will be good on the nationwide basis until the annual reporting cycle in 1983 and the collection of the data from those annual reports which will probably be completed in 1984. So we are looking to mid- to late 1984 before we have the kind of data base in hand that probably is needed to intelligently tell us how to best do a waste tax.

That concludes my formal statement. I would, of course, be happy to answer questions.

[The prepared statement of Mr. Cook follows:]

STATEMENT OF
MICHAEL B. COOK
DEPUTY DIRECTOR
OFFICE OF SOLID WASTE
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON INVESTIGATION AND OVERSIGHT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

MARCH 30, 1983

JACKSON, TENNESSEE

Thank you. I am Michael Cook, Deputy Director of the EPA's Office of Solid Waste. I appreciate the opportunity to be here today to discuss how the Agency's program under the Resource Conservation and Recovery Act (RCRA) encourages alternatives to land disposal of hazardous wastes.

Impact of the Hazardous Waste Program

RCRA requires EPA to regulate the generation, transport, treatment, storage, and disposal of hazardous waste as may be necessary to protect human health and the environment. The core of these regulations is now in place, and is being implemented by EPA and the States. The regulations have resulted in large increases in the costs of hazardous waste management over those of unregulated practices of the past. The cost of land disposal of hazardous waste under EPA's regulations, for example, is 10 to 20 times greater than just a few years ago. Further, these regulations require clean-up of any ground

water found contaminated at disposal sites now or in the future. Added to these possible costs is the potential legal liability for damages caused by releases from disposal sites.

Industry has responded to these increased costs by making process changes to avoid generation of hazardous waste, by reducing the amount of waste generated, and by recycling more waste than in the past. We hope to be able to quantify these changes based on reports from the regulated community over the next few years. While these are encouraging trends, the fact remains that the majority of hazardous waste is still disposed on or in the land.

Summary of the Regulatory Program

I would like to summarize EPA's hazardous waste program to provide a sense of the scope and depth of our regulations. In 1976, Congress gave EPA the authority to develop and implement uniform Federal standards governing hazardous waste management. The major pieces of these regulations were promulgated by EPA between May 19, 1980, and July 26, 1982.

The regulations create a management system intended to ensure that hazardous waste is safely transported, treated, stored, and disposed from "cradle-to-grave". The regulations identify hazardous wastes. They establish a manifest system to track the movement of hazardous waste from the place of generation to the preselected waste treatment or disposal

facility designated to receive the waste. Finally, they set management and financial standards for owners and operators of treatment, storage, and disposal facilities. These standards are implemented through permits that are issued by authorized States or EPA.

Since the initial promulgation of the hazardous waste regulations in May 1980:

- o An estimated 20,000 generators are now required to identify their hazardous wastes properly, ensure they are sent to an approved hazardous waste management facility, and maintain records of the amounts, types, and ultimate disposition of these materials.
- o Transporters of hazardous waste are required to comply with a manifest system to ensure that shipments are sent to authorized hazardous waste management facilities.
- o Almost 10,000 active hazardous waste treatment, storage, and disposal facilities are now subject to interim regulatory standards.
- o Thirty-six States have been authorized on an interim basis to operate part of the RCRA program. States have adopted new laws and regulations, reorganized, hired and trained new staff in the space of a few years, thus greatly expanding the amount of resources focussed on regulatory hazardous waste.
- o To determine if these facilities are meeting EPA's standards, over 26,000 inspections have been carried

out by Regional and State personnel since 1980.

- EPA has issued compliance orders to over 500 facilities, with penalties in appropriate cases, and referred several civil and criminal actions to the Department of Justice for violation of RCRA regulations.

<u>Land Disposal Regulations</u>

On July 26, 1982, we issued permit standards for hazardous waste land disposal facilities, which include landfills, surface impoundments, waste piles and land treatment. I would like to highlight these standards in a little more detail because of the concern expressed at this hearing over land disposal. Together with earlier rules they would:

- Require state-of-the-art technologies for land disposal, including highly protective liners, leachate collection systems and final covers for landfills.
- Prohibit disposal of most ignitable and reactive wastes (including cyanides and sulfides) that have not been treated.
- Prohibit disposal of wastes that are incompatible with other wastes or with liner systems.
- Prohibit disposal of containers holding free-standing liquids.
- Require proof of financial ability to close the facility properly and monitor and maintain it for 30 years after closure.

- o Require liability insurance.
- o Require a ground-water monitoring system.
- o Require removal of ground-water contamination, if it should occur.

We will issue detailed permits to each of the estimated 1600 land disposal facilities based on these standards. This permitting process is already well underway.

Alternatives to Land Disposal

EPA's program has focussed primarily on promulgating and implementing the program described above to regulate existing hazardous waste practices. We have, in addition, investigated and to a limited extent promoted alternatives to land disposal.

Between 1975 and 1980, EPA assessed the waste generated in 15 major industries. We also investigated the economic and technical practicability of alternative technologies for treating these wastes. The industries were: organic chemicals, pesticides, explosives, metal smelting and refining, inorganic chemicals, petroleum refining, rubber and plastics, storage and primary batteries, textiles, leather tanning, paint and applied products, pharmaceuticals, petroleum refining, and special machinery manufacturing.

We found that the basic technologies used for physical, chemical and biological treatment of dilute waste streams will serve to manage some kinds of hazardous wastes.

Hazardous waste streams, however, are typically highly concentrated. They often require engineering modifications to well established unit processes, development of new combinations of processes (or "process trains") and, in some cases, development of technologies that are currently only in research stages.

In addition to the studies of wastes from 15 industries, EPA prepared a summary of available alternative technologies and costs. Waste treatment technologies may be categorized as: (a) destructive processes which eliminate or substantially reduce the hazardous nature of toxic waste components, (b) removal processes which extract toxic components from waste streams, and (c) fixation processes, which stabilize waste components and thus minimize leaching. In general, these processes are more expensive than direct disposal of the hazardous waste. Removal processes, however, offer potential for recovery of valuable constituents from the waste and, thus, may have a net cost less than land disposal.

Another approach that may have a low net cost or even net savings for industry is to reduce the amount of hazardous waste generated. For example, solvents can be and often are filtered or centrifuged and reused on site, saving both the cost of new solvent and the cost of disposing of the used solvent other than the residual in the filter cake or sludge. Manufacturing processes can also be changed to eliminate

toxic ingredients so that produced wastes are not hazardous.

Thermal destruction is another effective means of treating the toxic components of organic wastes. We estimate that currently about 330 incinerators operate in the United States. We have established a 99.99% standard for destruction and removal of hazardous waste constituents and are beginning to permit these facilities to ensure they meet this standard. Some hazardous wastes are also burned in boilers as fuel to take advantage of heat value contained in the wastes. We are studying this practice with an eye to encouraging it where safe and restricting it where it might harm human health and the environment.

I would note that most, if not all, of these processes produce a residue requiring disposal, often in or on the land. Thus, alternatives to land disposal typically themselves produce wastes that must be land disposed.

Before the first waste exchange was established in the U.S. in 1976, wastes were exchanged among chemical engineers on an informal basis. A study conducted by EPA in 1976 disclosed that six million metric tons of industrial waste were available for reuse -- an amount worth $300 million annually. EPA's assistance and participation in waste exchange workshops across the nation, and the economic incentive resulting from the hazardous waste regulations have contributed

to increasing the number of waste exchanges in operation in 1983 to 37.

EPA has also promoted reuse and recycling by giving some types of wastes and waste management a special or exempt status under our regulations. The most recent examples are included in our proposal to amend the definition of solid and hazardous waste. We are proposing to regulate those waste recycling situations that have caused or have the potential for causing substantial environmental harm. Examples include burning of hazardous waste as fuel and application of waste to the land (for example, as a dust suppressant). We would, at the same time, conditionally exempt from regulation those recycling operations posing low risk to the environment such as many kinds of reuse on the site where waste is generated.

Research on Alternative Technologies

The principle focus of our hazardous waste research in the last few years has been on supporting regulatory controls on alternative technologies, especially incinerators. This research is having the ancillary benefit of advancing the basic understanding of these technologies. We are also

investigating other alternative technologies, including use of microorganisms to transform or fix hazardous waste, various kinds of unusual thermal destruction techniques, and different approaches to waste fixation. We have budgeted for these activities about $10.1 million in FY '82, $8.3 million in FY '83, and plan about $7.3 million for 1984.

Finally, we have expended considerable amounts of money in developing equipment to deal with uncontrolled waste sites and hazardous waste spill incidents. Technologies developed include a mobile incinerator, an activated carbon treatment unit, and a variety of containment and control devices for spills on the water. We have budgeted an estimated $13.5 million over the last three years for this research.

Planned New Restrictions on Land Disposal

EPA is planning additional restrictions on land disposal of hazardous waste. We expect they will have the practical effect of accelerating use of alternative technologies by the regulated community.

We are examining rule-changes to restrict disposal of bulk liquids in landfills, regulate air emissions from land disposal facilities, and require lateral expansions of existing facilities, that occur before permitting, to meet the liner requirements for new facilities.

Along with these near-term controls, we are identifying wastes that are highly mobile, toxic, and persistent and have a strong tendency to bioaccumulate. We will explore the availability of alternate management technologies for these wastes as well as their costs and environmental impacts. On the basis of these considerations, we intend to prohibit additional wastes from disposal in or onto the land.

In conclusion, the Agency is in favor of discouraging land disposal of wastes which we are uncertain will be contained properly in the very long term. We will encourage alternatives to land disposal whenever practicable and protective of the environment.

I appreciate the opportunity to meet and share this information with you. I will be happy to respond to any questions you might have.

Mr. GORE. Well, I appreciate your statement very much.

You have outlined several potential objections to changing the fee system in the manner that I and the Chemical Manufacturers Association would like to see it changed. You note, first, that in the current law, EPA is required to issue a report at the end of 1984. And that date, in the law, marks the end of 1984 as in some ways the end of a first shakedown cruise with Superfund, and your implication is that that would be the appropriate time to make such a sweeping change.

Second, you raise the possible objection that a fee on the wastes stream might serve to provide an additional encouragement to midnight dumpers.

Third, you again discuss the problems of collecting a tax that would be paid by a larger class of taxpayers or fee payers.

And finally, you raise some of the technical problems that would have to be resolved in designing such a fee, that is, coming up with the graduated categories—coming up with categories to which a graduated fee could be applied.

I think all of those points have some real validity. I, myself, talked about the problems of encouraging midnight dumping and collection problems during the debate on Superfund back in 1980. These points were all discussed then. And we did include that provision to allow us to take another look and evolve the nature of the fund as we learned something.

But I think we have learned faster than we thought we were going to learn. And I think we have accumulated data at a faster rate. And most importantly of all, I think the economic effect of

the fee as it is now structured is perverse, and the economic effect of a fee on the waste stream would be laudatory, or rather would assist adaptation of industry to what we need to have done, that is, the reduction in the amount of waste being generated and a proper disposal and treatment of the waste that is generated.

And it seems to me, Mr. Cook, that although your points are well taken, in my view the importance of getting the forces of the marketplace to work for us, instead of against us, is an overriding value, and should lead us to take the bull by the horns and make this change in the fee structure now rather than 2 years from now, because the problem is getting worse every day.

How do you react to that statement? I mean, I accept the reservations you have and the potential objections you are raising, but I just believe that the forces of the marketplace are like gravity. They are going to work whatever you do. They are going to work for you or against you, depending on how the marketplace is tilted. And in this case we have tilted it toward irresponsible waste disposal. And those forces are so powerful. Witness after witness today has described what a powerful force the marketplace is in driving us toward the result that we have today. And because it is so powerful, it seems to me of overriding importance to recognize the way those marketplace forces are working, and try to take them into account in the design of these Government programs. And specifically to get the marketplaces to send signals to the people who are generating wastes that will encourage them to reduce the amount of waste, recycle it, reuse it, treat it as responsibly as they possibly can. It is a matter of weighing relative value. It seems to me that this one is overriding.

What is your reaction?

Mr. COOK. I agree that the economic incentives could work importantly to help out on this problem of the disparity in apparent cost between land disposal and other kinds of waste handling. I would react in two ways: One comment is that if you want to move as quickly as you are suggesting, I think you are going to have to be prepared to be quite arbitrary in resolving these basic issues of equity and policy.

Mr. GORE. Are you talking about your final category now, the design of the categories to which a graduated fee would be——

Mr. COOK. That is right.

Mr. GORE. You would either have to be prepared to phase in the graduated aspect of the fee and impose a flat fee in the beginning—

Mr. COOK. That, I would consider, an arbitrary action. You see, that is just one arbitrary——

Mr. GORE. Arbitrary, but not necessarily unfair.

Mr. COOK. I think I will find a lot of people who will argue with you on that, specifically, industrial representatives who would argue that it is very unfair because of the degree of hazard concerned and things of that kind.

Now, I am not saying that that is a bad idea. All I am saying is that you would have to do something like that. You would have to move to some kind of relatively quick decision which did not drive us to carefully balance these equities and policy considerations.

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And I think that the Congress would have to do it. I don't think you could turn it over to the agency and expect that it could be done in a very, very quick timeframe. I think that we would feel it incumbent on us to analyze these issues, collect the necessary data and try to come up with some kind of a balance of equities and careful consideration of the policies.

The other thing I would note, if you are mistaken, mistakes could be quite high.

We do have a couple of States which have imposed waste-end fee systems. One that I know a little bit about is Florida. They apparently badly miscalculated on the amount of income that they would get as their fee. And the last time I was down there they told me they spent $80,000 collecting $40,000. Obviously, if the comparable thing happened at the national level, we would have to shutdown the Superfund program.

Mr. GORE. Well, those are welcome caution flags. They haven't dampened my enthusiasm at all, however.

Mr. Stoots, help me out here. What is your reaction to Mr. Cook's reservations? There have been some occasions in the past where Chemical Manufacturers Association and I have been on the same side. A lot of times we have been on the opposite side of the fence, but——

Mr. STOOTS. Today we are on the same side.

I think that the points that Mr. Cook has raised are legitimate concerns. By our support of the waste disposal fee, we don't mean to make light of some of these burdens and complications that might result. But I think we could still stand behind the fact that we believe the problems that we are facing today with hazardous waste disposal are not related to how many or how much chemical feedstock used or to some degree directly related to how much hazardous waste is generated. But it is related to how much is disposed.

And I agree with you that the free enterprise system directs a lot of our judgments and our decisions and if we can put the fee in the right place to discourage that kind of action, then that is where it should appropriately go. The chemical industry is not trying to undermine the Superfund fee by redirecting the taxing mechanism at all. We wish to encourage the proper mechanism of waste management.

Mr. GORE. Professor Getz, this is your specialty. Do you agree with my assignment of a very high value to the power of the forces of the marketplace this makes?

Mr. GETZ. Absolutely. I need you to come to my classes and speak to my students about the power of the marketplace. That is marvelous.

I would comment here that your reason for looking at the waste end tax is to create incentives for proper disposal. That is a different function of a tax than funding Superfund. And it may well be that you want to break that link.

Mr. GORE. No; I want to create incentives for the reduction in the amount of hazardous waste.

I have been impressed in the 6 years that I have been in Congress with the amount of energy that is devoted by corporations to the reduction of tax payments. And if that source of energy can be

directed to reducing the amount of hazardous waste generated in the United States, I think we might see a dramatic reduction.

Mr. GETZ. It is not a bad thing that Florida spent $80,000 to collect $40,000 of this tax, because that $80,000 was really 80,000 dollars worth of regulatory effort. They were out monitoring waste treatment.

Mr. GORE. Without knowing more about the Florida effort, I hesitate to agree, but it certainly is plausible that they are getting additional benefits to that in addition to just the money.

Well, in your acutely hazardous category that you referred to, Mr. Cook, is dioxin in that category?

Mr. COOK. Dioxin, incidentally, is not something that exists in the environment as a product. It is a byproduct of the production of certain pesticides and other things and appears in the waste as a byproduct. We do not currently regulate wastes containing dioxins under the regular program.

Mr. GORE. Why not?

Mr. COOK. The answer—there is no answer to that question. We have just come out with a proposal to do so, and place the waste containing dioxins in the acutely hazardous category, and furthermore, to add other special management requirements on those wastes.

Mr. GORE. I certainly hope they get it implemented expeditiously.

Professor Getz, until they do, you are going to have to change the example you used of the standard truck filled with water and the teaspoon of saccharine is treated much more carefully than a tank or truckful of dioxin.

Let me recognize Congressman Durbin.

Mr. DURBIN. I am going to try to be very brief. It is getting late and you have shown extraordinary patience in waiting to testify here.

Professor Getz, I can't help but be struck by your testimony.

Wouldn't you say that historically, at any time the Government gets in the business of regulating, the yellow flag is always brought up. It is an economic disincentive. It would hurt productivity. It will encourage illegal activity. Doesn't that almost go without saying that is part of our regulation?

Mr. GETZ. Yes; that leads us to look for a balance between the payoff from the regulation, which is very real, and these costs.

Mr. DURBIN. But you would concur with what Congressman Gore said today that if we could put this in terms of the marketplace, where we could put the burden of this environmental hazard suffered by society on the shoulders of those who are producing the product, which we would, of course, if the price structure which is used more equitably and we would have a better chance of policing it internally?

Mr. GETZ. Absolutely. Those prices, those taxes ought to bear some relationship to the real hazards which people incur. They have got to be a lot higher than the real consequences of those wastes.

Mr. DURBIN. What did you think about the testimony earlier of Ms. Harrington who suggested if they weren't high enough, they would not notice them in the marketplace?

Mr. GETZ. I disagree very much with that statement. These taxes could be too high. It may well be that landfill is the best we can do in the current state-of-the-art until alternatives become relatively cheaper and we gain experience and have those technologies available at lower prices.

Mr. DURBIN. It seems like we are getting down to either your money or your life choices here.

Mr. GETZ. That is exactly right.

The point I was making was, let's save as many lives as possible by concentrating our resources, our lifesaving efforts, where we can do so most inexpensively. It is silly to spend $1 million to save a few lives in hazardous wastes when this million dollars could save many more lives when they are used in less expensive ways of saving lives.

Mr. DURBIN. That's one of the points—I don't know if you are familiar with Professor Thoreau. He raises the point that perhaps you reach a point where the product is too expensive for this society considering what the long-term cost is going to be.

I don't know what is involved in the production of the product that led to the dioxin, that led to the Federal Government buying Times Beach, but I wonder whatever that product whether the number of people employed was worth the cost. It seems now that they are starting to realize the long-term costs of some of these are incalcuable.

I am struck, too, by Mr. Cook's statement here, and I am sure that wasn't your idea. You were recounting what is involved in the law, that we look to financial responsibility for simple landfill disposals for 30 years, when we can't even assume those years today; they are saying we are talking about 5 to 10 centuries before we see the end of the hazard and toxicity of some of these elements. It seems we are dealing in a very short timeframe here, and this is the beginning of it, and we are leaving to the next generation, the next generation of Federal workers, Congress, or whoever it might be, some of the major responsibilities that go on for centuries. How do you balance this in your own mind in terms of the EPA's function?

Mr. COOK. Well, I think that you have hit on a fundamental point that I think you are well practiced on. You are worrying about a high level nuclear waste, because obviously that is as much a concern as for the toxic waste.

When we were looking at the issue of land disposals—I think you may have been out at the time—we looked at it from the point of view of regulating the state-of-the-art or practice that existed, not with an eye to doing away with that practice or severely restricting the practice which is the idea that has been discussed today, and is becoming—there is an emerging consensus that we should be restricting the practice appropriately.

When we asked ourselves, working from the premise that we would regulate but not do away with the practice, and we ask ourselves: How do we regulate that practice? We had to deal, we felt, in a timeframe that could reasonably be imposed on the responsible parties. And that typically seemed to us to be in terms of the future generations rather than a few millennia.

Mr. DURBIN. Excuse me, do those tests mean that after 30 years it is no longer a matter of the marketplace, it is now society's burden to carry on? And what we have said is: For 30 years make it work and then if you happen to be out of business at that point, we will assume as a society that it is our responsibility.

Mr. COOK. Let me make two comments on that. First, a technical correction on what I said. The 30-year period we normally do not find any contamination of ground water. If you do find contamination, then you have to monitor for an extended period and clean up the contamination, as long as the company is still around in a couple hundred of years.

Mr. DURBIN. If the company is still in business.

Mr. COOK. If the company is still in business.

The other thing, though, that I would note here is that Congress in the Superfund law very specifically wrote in a provision that would have the Government, through a fund that was established under the Superfund law, assume responsibility for these sites. So actually this was an act of Congress.

Mr. DURBIN. I just got there.

Mr. GORE. All right. Thank you all. I want to thank you all. I want to particularly thank Mr. Stoots. I particularly liked your testimony.

I would like to ask you a question about your organization, your association.

I take it from your testimony and that which is included by Mr. Mullins, that 90 percent of the businesses involved in the manufacture of industrial chemicals are members of your association. Can you give me some kind of rough percentage of what level of involvement you have in this whole field we have talked about today, the generation of toxic wastes, hazardous wastes, chemical wastes, what portion is affected by your association?

Mr. STOOTS. You are asking me what percentage is the chemical industry of total hazardous waste generated?

Mr. GORE. Correct. Do you have any figures?

Mr. STOOTS. I don't have any figures.

Mr. DURBIN. Glad you were with us. Thank you very much.

Mr. STOOTS. I would like to say, getting back to the business of a waste disposal tax, that this has been an issue that the Chemical Manufacturers Association has supported from the time the Superfund was passed. And this is not a new issue for us. We are well aware of some of the complications and we will be personally happy to offer our help to wrestle some of these real serious concerns.

Mr. GORE. We would appreciate that, and we will likely take you up on that offer.

You also support the banning of landfill disposal of certain kinds of wastes enumerated in the House bill rewriting RCRA last year; is that correct?

Mr. STOOTS. Yes, sir.

Mr. GORE. And that includes halogenated solvents, pesticides, metal finishing wastes, and potential dioxin contained waste. That list I am taking from Mr. Robertson's testimony. Is that the same—does that list correspond with the H.R. 6307 list or not?

Mr. STOOTS. I was confused by that testimony earlier. You know, it was my understanding that H.R. 6307 made reference to free standing liquids and bulk liquids in landfills, and I don't recall that it went to specific materials.

Mr. COOK. H.R. 6307, if I may, Mr. Chairman, suggested that we look at the possibility of banning certain of these substances.

Mr. GORE. Including the four I mentioned?

Mr. COOK. I am not sure it was all four, but it was at least three out of the four.

And also we were directed to look at wastes that the States were considering banning as well.

Mr. GORE. Well, let me ask you, Mr. Cook, do you think that halogenated solvents ought to be banned for landfill disposal?

Mr. COOK. I would answer probably, but not certainly. We still are just in the very early stages of looking at alternatives to handling those sorts of substances.

Mr. GORE. Well, don't we know that they will eat through landfill liners, and clay and get into the ground water? We know that, don't we?

Mr. COOK. Well, first of all, there are certain kinds of artificial liners that they will not eat through, so far as we can tell. But if they do, then they are already banned from the new land disposal facility. As I mentioned, we banned disposal of waste inland if they are incompatible with liner systems.

Mr. GORE. Well, is it up to the disposer to make that determination as to whether or not it is incompatable?

Mr. COOK. He is required, in his permit application, to make a demonstration that the wastes that he proposes to put in the land disposal facilities are compatible and not incompatible.

Mr. GORE. Well, have any made demonstrations that halogenated solvents are compatible with their new landfills?

Mr. COOK. I don't know how to answer that question. We have processed very few permits——

Mr. GORE. Could you provide that for the record?

Mr. COOK. Yes, sir.

Mr. GORE. As a matter of fact, halogenated solvents will go right through clay. Isn't that correct?

Mr. COOK. I would not say categorically that that is true. There are certain kinds of organic wastes that do rapidly move through clay. I would not say categorically that all halogenated solvents do that.

Mr. GORE. Most?

Mr. COOK. I would like to provide an answer for the record on that, too.

[The following information was supplied for the record:]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

11 MAY 1983

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Honorable Albert Gore, Jr.
Chairman, Subcommittee on
Investigations and Oversight
Committee on Science and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I very much enjoyed the opportunity to testify before your Subcommittee in Jackson, Tennessee, on March 30. The hearing provided an extraordinarily comprehensive review of the major issues associated with encouraging use of technologies as alternatives to land filling.

You asked at the hearing that I provide answers to two questions for the record. The first question was about the effect of halogenated solvents on clay liners. Preliminary research data indicate that a clay liner presaturated with water will undergo substantial shrinkage and a consequent cracking and increase in permeability after exposure to pure halogenated solvents. We cannot determine with presently available data whether halogenated or nonhalogenated solvents pose a greater risk to the integrity of clay liners. However, it is likely that all solvents with dielectric constants less than water will cause clay liners to shrink. The enclosed paper by David Anderson gives a more detailed explanation of the effects of pure halogenated solvents on clay liners.

Your second question was whether we have determined in the process of issuing land disposal permits that any liner is compatible with halogenated solvents. The answer is that we have not made any such determination. We are just beginning to process permit applications from land disposal facilities.

Please let us know if we can answer any additional questions.

Sincerely yours,

Michael B Cook

Michael B. Cook
Deputy Director
Office of Solid Waste

Enclosure

Effect of Halogenated and Nonhalogenated Solvents on Clay Liners

by
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Several studies have indicated that organic solvents can greatly increase the permeability of clay soils (Buchanan 1964; White 1976; Anderson 1981; Anderson and Brown 1981; Schram 1981; Anderson et al. 1982; Brown and Anderson 1983; Brown et al. 1983). Simply stated, it is the relative volume that a given clay occupies with different liquids adsorbed that gives rise to the potential for large changes in permeability. If, for instance, a clay soil is, as is invariably the case, initially coated with water, but then the water is displaced by a liquid that results in the clay occupying a smaller volume, gaps form in the clay. A proven measure of the degree of swelling clay will undergo when exposed to various liquids is the dielectric constant of a liquid (Murray and Quirk 1982; Barshad 1952). If a liquid has a high dielectric constant, clay will undergo a relatively large amount of swell. Conversely, liquids with low dielectric constants tend to cause very little swelling in clay. So if a clay is initially coated with a high dielectric constant liquid but this liquid is displaced by a low dielectric liquid, a reduction in the volume of he clay can be expected. This type of volume reduction or shrinkage in clay liners would invariably cause shrinkage cracks to form and, consequently, large permeability increases. Table 1 ranks water and various organic liquid (both halogenated and nonhalogenated) according to their dielectric constants. As can be seen, the dielectric constants of nearly all solvents are considerably below that of water

Table 1. Dielectric Constants, Densities and Water Solubilities of Various Halogenated and Nonhalogenated Solvents [Anderson et al 1983; Nellan [illegible]]

Name	Dielectric Constant	g/cm^3	@ 25°C Water Solubility
Water	78.5	1.00	--
Methanol	32.7	0.79	Miscible
Ethanol	24.6	0.79	Miscible
Benzyl Chloride	23.0	1.10	Moderately Miscible
Acetone	20.7	0.79	Miscible
1-Propanol	20.3	0.80	Miscible
1-Butanal	17.5	0.81	Miscible
1-Pentanol	13.5	0.81	Miscible
Pyridine	12.4	0.97	Miscible
Phenol	9.8	1.05	Miscible
Dichloromethane	8.9	1.31	1.32%
1-Bromopropane	8.1	1.34	
1-Chloropropane	7.7	0.89	
1,1,1-Trichloroethane	7.5	1.34	Slightly Soluble
Aniline	6.9	1.02	Soluble
Chloroform	4.8	1.48	0.82 %
Bromoform	4.4	2.89	0.10 %
1,1,2-Trichloroethylene	3.4	1.48	0.10 %
Toluene	2.4	0.87	Slightly Soluble
Benzene	2.3	0.88	Slightly Soluble
Carbon tetrachloride	2.2	1.60	0.08% %
Cyclohexane	2.0	0.78	45 ppm
Hexane	1.9	0.65	

This strongly indicates that a clay liner presaturated with water would undergo substantial shrinkage and consequential permeability increase after exposure to organic solvents, halogenated or nonhalogenated.

Many of the nonhalogenated solvents are miscible with and hence diluted by water. In addition, nonhalogenated solvents are generally less dense than water and so they would be likely to either dissolve in or float on water. Halogenated solvents, however, are generally less soluble in and more dense than water. This would increase the likelihood of a clay liner being exposed to the concentrated halogenated solvents even if the liner is covered with a layer of water. Consequently, in the lingo of clay liner companies, most halogenated solvents are referred to as "sinkers" while nonhalogenated solvents are referred to as either miscible with water or, if the solvent is immiscible with and less dense than water, it is referred to as "floaters."

It is hard to determine with the presently available data base whether halogenated or nonhalogenated solvents pose a greater risk to the integrity of clay liners. However, it can be safely assumed that all solvents with dielectric constants less than water will probably cause clay liners to shrink.

Floaters may cause permeability increases in surface impoundment and landfill clay liner sidewalls. In addition, these organic liquids may cause damage to the clay liners on the bottom of these facilities during any periods when dry climatic conditions cause the facility to lose its protective water layer. Sinkers, on the other hand, may not be impeded by the less dense water layer.

In a recent article by Burmaster and Harris (1982), it was obvious that halogenated solvents are at least as prevalent as nonhalogenated solvents in water obtained from contaminated drinking water wells (Table 2). It is also obvious from the data that higher concentrations of these toxic solvents are being found in ground water rather than surface water. The continued land disposal of either

Table 2. Toxic Organic Compounds Found in Drinking Water Wells and Surface Water in the U.S. (Burmaster and Harris, 1982)

Chemical	Concentrations Reported (ppb)	Highest Surface Water Concentration Reported (ppb)
Trichloroethylene (TCE)	27,300; 14,000; 3,800; 3,200; 1,530; 900	160
Toluene	6,400; 260; 55	6.1
1,1,1-Trichloroethane	5,440; 5,100; 1,600; 965	5.1
Acetone	3,000	NI
Methylene chloride	3,000; 47	13
Dioxane	2,100	NI
Ethyl benzene	2,000	NI
Tetrachloroethylene	1,500; 740; 717	21
Cyclohexane	540	NI
Chloroform	490; 420; 67	700
Di-n-butyl-phthalate	470	NI
Carbon tetrachloride	400; 135	30
Benzene	330; 230; 70; 30	4.4
1,2-Dichloroethylene	323;294;91	9.8
Ethylene dibromide (EDB)	300; 100; 35	NI
Xylene	300; 69	24
Isopropyl benzene	290	NI
1,1-Dichloroethylene	280; 118; 70	0.5
1,2-Dichloroethane	250	4.8
Bis(2-ethylhexyl)phthalate	170	NI
DBCP (Dibromochloropropane)	137; 95; 68	NI
Trifluorotrichloroethane	135, 35	NI
Dibromochloromethane	55; 20	317
Vinyl chloride	50	9.8
Chloromethane	44	12
Butyl benzyl-phthalate	38	NI
gamma-BHC (Lindane)	22	NI
1,1,2-Trichloroethane	20	NI
Bromoform	20	280
1,1-Dichloroethane	7	0.2
alpha-BHC	6	NI
Parathion	4.6	0.4
delta-BHC	3.8	NI

halogenated or nonhalogeanted organic solvents would appear to be substantially degrading the groundwater resources of the U.S. and probably other industrialized countries. Speaking from the prospective of a person who has been involved with agricultural research issues for 10 years, there is little doubt that this country is headed for a massive water shortage. This is, no doubt, the worst possible time for the contamination of a substantial portion of the remaining groundwater resource.

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Mr. GORE. Does anybody else have—Mr. Stoots, do you know the answer to that question?

Mr. STOOTS. No, sir, I don't. I am not familiar with the permeability of these, but I will be happy to find out.

Mr. GORE. Well, the other witnesses seem to agree with that statement. And I think scientific evidence will reflect the fact that halogenated solvents do, indeed, migrate readily without difficulty through clay and through most liners. In fact, the liners that were checked in a study done in Princeton showed that all of the liners they checked leaked, and that none were a hundred percent effective.

What would you do, Mr. Cook, in a situation where you had a lot of halogenated solvents in a disposal site separated from drinking water for lots of people only by clay?

Mr. COOK. Are you assuming now that the halogenated solvents are incompatible with clay liners?

Mr. GORE. I am assuming that, yes. Let's assume that.

Mr. COOK. Well, if this is an active waste site——

Mr. GORE. No, it is an inactive waste site.

Mr. COOK. The way we are currently setup, that would be a possible subject for Superfund action or action under RCRA, if there is an imminent and substantial hazard to public health created by that site.

Mr. GORE. Imminent being—

Mr. COOK. As the standard has been interpreted so far by the courts, imminent—I am not the best one to answer this, but imminent is not right now.

Mr. GORE. It can be something that is relatively certain to occur in the future?

Mr. COOK. That is right.

Mr. GORE. Should it be removed? If you determine that solvents are incompatible with clay liners and determine that drinking water for lots of people is underneath the clay liner, should it be removed?

Mr. COOK. I think that if this were a priority under Superfund, we would do——

Mr. GORE. I am just talking about—let's separate it from the legal context. I just want your commonsense answer. Should it be removed or should we leave it there?

Mr. COOK. I think that as a matter of public policy in line with what Mr. Getz was saying, that we ought to concentrate our resources and efforts on problems that actually exist rather than potential problems at disposal sites.

Mr. GORE. Well, you would leave it there, then?

Mr. COOK. I would leave it there because there are much higher priority sites which are already creating potential problems that should receive our attention.

Mr. GORE. And implicitly you are saying that we can't afford to take steps to avoid the poisoning of the ground water underneath that clay.

Mr. COOK. Not given the current availability of funds, under Superfund.

Mr. GORE. So because we can't afford it, just let the ground water get poisoned?

Mr. Cook. I think you can probably go around the country and find thousands, if not millions, of potential problems that probably ought to receive some kind of attention to avoid a more costly future. However, at the same time, you can find loads of problems that are with us right now at the present time that should receive attention. And I think it is those that we have the necessity to focus on.

Mr. Gore. Well, you seem to put this hypothetical—we know that the solvents are going to eat their way through to the groundwater. Tell me again why we should ignore that.

Mr. Cook. All I am saying is that given our limited resources, we have existing serious problems and that is a potential problem.

Mr. Gore. Why is it a potential problem? Because it has not yet reached the ground water?

Mr. Cook. Yes.

Mr. Gore. It is not a current problem because it is definitely moving toward the drinking water? It will stop being a potential problem when the ground water is poisoned. Then it is a problem, according to your definition?

Mr. Cook. All I am saying is that we have groundwater that is already poisoned which is not receiving attention.

Mr. Gore. So why waste our time on future poisoning.

Mr. Cook. The immediacy of the problem that they are creating is the important thing.

I would comment on one other aspect, which is kind of on the side.

Mr. Gore. Before you do that, I want to finish up the discussion of this central issue, because if we have a case where a poisonous chemical is moving toward the ground water supply, we know it is going to get there, we know we can stop it by removing it before it gets to the ground water——

Mr. Cook. That is what I wanted to comment on, Mr. Chairman.

Mr. Gore. All right.

Mr. Cook. We have very little experience with actually digging up uncontrolled closed waste sites or what you are implying digging up, subsurface below the waste site. In fact, we are very nervous about the dangers to those who are undertaking such operations. Also, the cost may be enormous. It may have to be done a spoonful at a time making sure that it is not done in a dangerous way.

So, under these circumstances, it may be safer to handle the problems by monitoring, and if and when the ground water contamination begins, you can proceed to clean up the ground water, and prevent the migration and contamination of the site.

Mr. Gore. Do you agree with the list of Mr. Robertson and Mr. Stoots? We talked about that before and I don't think I gave you a chance to respond correctly to the question I asked.

We got off on another subject. What do you think about those four that he recommended for bans against landfill proposal?

Mr. Stoots. I really can't react to those. I am not familiar with the particular materials that you mention. But I appreciate the opportunity to speak.

Mr. Gore. Do you agree with the statement that I made that unless regulations against irresponsible dumping of hazardous

wastes are enforced, the responsible companies are put at a disadvantage in the marketplace as against others who would cut costs by dumping irresponsibly?

Mr. STOOTS. I think we, as responsible waste managers, would suffer some disadvantage in the short run, but I am confident in the long run that it is to our advantage to comply with the regulations and protect health and environment.

Mr. GORE. And it is our duty in the Government to make certain that you do not get undercut by someone violating the law, and we should do that by insisting upon the enforcement of the law.

And, Mr. Cook, you are not the one to take that up with, but we all know, as I am sure you do, even though you can't say so, that the new regime at EPA will change the atmosphere. You do not have to comment on that.

What about the degree of hazard approach, Mr. Stoots? Is that possible or do you agree with the objections that Mr. Cook raised to that?

Mr. STOOTS. I think someone pointed out earlier that there is a lot of disagreement over just what is the degree of hazard approach. I think the best that can be done is to categorize these materials into some dozen or so categories. I don't know how specific it should be. I don't know what the specific number should be. But we are going to somewhere have to make ends meet.

Mr. GORE. Do you, Mr. Cook?

Mr. COOK. Mr. Chairman, I have the sense that I have been seen in an adversary role on the degree of hazard approach, and the waste end tax, and so on, and that was not my intention. My intention was to enter some reservations. But I think it may take some time possibly to measure that, a couple of years to undertake what you suggested unless you are prepared to be quite arbitrary. I am not saying that it is a bad idea or one that ought to be dropped or anything.

Mr. GORE. I did not misunderstand the reservations you expressed. What about the small generator exception? EPA officially opposed the plugging of that loophole last year and indeed opposed the entire bill—the reauthorized bill in the House. Do you have any indication, yet, as to whether or not the EPA's position is going to change on that matter?

Mr. COOK. Yes, sir. Only an indication, though. The Assistant Administrator, the Acting Assistant Administrator, Lee Thomas, did testify last week that we do believe some additional regulation of generators will be necessary. And he noted that we have a study on the way of how to appropriate this and how it might be done.

Mr. GORE. Fine.

Mr. Stoots, has the CMA taken a position on small generators?

Mr. STOOTS. No, sir. The Chemical Manufacturers Association has not.

Mr. GORE. OK. Let me thank all of you for coming. It has been a very long day. And those who have been patient enough to sit throughout the entire day, I appreciate it very much.

I do hope that the record of this hearing will be helpful in designing a better national program to deal with the problems associated with the hazardous waste program, to deal with the problems associated with hazardous waste.

All of the witnesses on this panel, I thank you. Those on the other panels, I want to express my thanks.

And I want to express my thanks to the subcommittee for its effort and time that you took to help us in this effort.

And we may have some additional questions for the record. I would call on Congressman Durbin.

Mr. DURBIN. I just want to thank the chairman, Mr. Gore, for the opportunity to not only invite me to Tennessee, but to visit in this context and to discuss what I consider to be an important issue wherever your home may be. I think it has been well publicized in Tennessee.

In the hallway on the way to lunch someone said: You have been through Wilsonville? Well, we have been through Henderson County. We have got similar stories to tell all over this country.

I want to take this time to salute the chairman for calling this committee hearing in Jackson, Tenn., and I thank you for the hospitality you have extended to me today.

Mr. GORE. I appreciate your comments. Thanks to all of our witnesses and guests.

We will have a follow up hearing in Washington, D.C. We will have a record and recommendations that we trust will be of benefit to those who are trying to solve this problem along with us.

The hearing will stand adjourned.

[Whereupon, at 5:30 p.m., the subcommittee adjourned.]

24-419 O—83——16

HAZARDOUS WASTE DISPOSAL

WEDNESDAY, MAY 4, 1983

House of Representatives,
Committee on Science and Technology,
Subcommittee on Investigations, and Oversight
Washington, D.C.

The subcommittee met, pursuant to call, at 9:30 a.m., in room 2325, Rayburn House Office Building, Hon. Albert Gore, Jr. (chairman of the subcommittee) presiding.

Mr. Gore. The subcommittee will come to order.

I would like to welcome our witnesses and guests today. I have an opening statement, and then we will hear from the first panel. Congresswoman Schneider may have some comments as well.

Today marks the second day of 2 days of hearings by the subcommittee on the subject of alternative technologies for hazardous waste disposal. The first of the hearings was held on March 30 in Jackson, Tenn.

At that time, the subcommittee heard testimony from scientists, government officials, and industry representatives about the need for and feasibility of alternatives to landfill disposal of hazardous waste.

The subcommittee also heard testimony from representatives of the Congressional Office of Technology Assessment and the National Academy of Sciences. Both of these agencies recently completed extensive studies on alternative technologies.

The overwhelming consensus of the testimony presented on March 30 was that the landfill disposal of hazardous waste should be used only as a last resort. It was made abundantly clear that no landfill can be made completely safe for all substances under all conditions for all time.

Already the indiscriminate disposal of hazardous waste in landfills has created serious health threats in countless areas around the country, and there are thousands of other waste sites that are simply ticking time bombs waiting to explode.

Despite the significant problems associated with land disposal of hazardous wastes, our Nation continues to dump enormous quantities of waste into landfills. According to the Office of Technology Assessment, approximately 250 million metric tons—or 500 billion pounds—of hazardous waste are generated annually in this country. Between 80 to 90 percent of this waste is dumped into landfills.

The especially disturbing aspect of our national hazardous waste problem is that it is so unnecessary. There is no reason for us to continue dumping such vast amounts of waste into landfills. The testimony at our March 30 hearing made it very clear that alterna-

tive technologies for waste disposal do exist and are available to reduce our destructive dependence on landfills.

Why, then, are alternative technologies not more broadly utilized? The problem is that landfill disposal of hazardous waste is presently unrealistically inexpensive when compared to some of the alternative technologies. The current short-term monetary expenses involved in landfills grossly underreflect the true cost of landfills to our society, in terms of both the threats to our health and safety and the economic costs of cleanups.

Indeed, the Office of Technology Assessment has estimated that it costs 10 to 100 times more to clean up a hazardous waste site than it would have cost to dispose of wastes properly in the first place.

The Environmental Protection Agency calculates that cleaning up the known sites around the country will cost, on the average, $6.5 million. Thus, the key issue is how to make landfill disposal less attractive to industry and alternative technologies more attractive.

One purpose of this hearing today is to consider that issue. We have with us officials from several States that have adopted programs to ban or discourage landfill disposal of highly toxic wastes and to encourage utilization of alternative technologies.

We also have with us representatives of companies that have adopted or are in the process of adopting alternative technologies. They can help us understand what is needed to facilitate more widespread usage of alternative technologies.

Before we hear from those witnesses, however, we will consider the availability of alternative technologies to treat and dispose of two very hazardous substances: PCB's and dioxin. These two substances are among the most toxic wastes, and contamination resulting from the land disposal of these two substances has created enormous health hazards across the country.

The manufacture of PCB's in the United States was banned in 1979, and a prohibition on the landfill disposal of the substance was issued a year later. Nearly 750 million pounds of highly concentrated PCB's are still in use nationwide, however, and these PCB's will have to be disposed of eventually. Moreover, as we Tennesseans know from our experience with the Old Waynesboro Dump in Wayne County, Tenn., enormous quantities of PCB's were dumped into landfills prior to the issuance of the landfill ban.

The EPA estimates that there are nearly 290 million pounds of PCB's located in landfills across the country and that an additional 150 million pounds are dispersed throughout the environment. These PCB's must now be removed and disposed of properly.

The same is true for dioxin. The widespread dioxin contamination in both Missouri and Michigan is a tragic illustration of the reckless disposal practices of the past. The State of Missouri is now engaged in a comprehensive search to find ways to dispose of the dioxin that contaminates its soil.

Moreover, despite the fact that it is 170 times more deadly than cyanide, dioxin is presently not even considered a hazardous substance by the EPA under the Resource Conservation and Recovery Act and thus can be put into landfills like any other chemical

waste. Who knows how much dioxin is being put into the ground at this very moment?

Our first panel will help us consider the problems posed by these substances. Before introducing our first panel, I would like to recognize Congresswoman Claudine Schneider.

Mrs. SCHNEIDER. Thank you, Mr. Chairman.

I would only like to mention that there is a great deal of public awareness of the problem of hazardous waste. I would like to commend the chairman for holding this hearing, which will hopefully assist us in satisfying the information lag which exists; that is, from identifying the problem to seeking the solution, and to determining whether government incentives are necessary and to what degree we can make the technology that is available more widely used.

Thank you, Mr. Chairman.

Mr. GORE. Thank you.

I didn't recognize first our ranking minority member, Congressman Joe Skeen.

Mr. SKEEN. Thank you very much, Mr. Chairman.

You will note that I come from a district that is now in the process of completing a Waste Isolation Pilot Project for low-level defense radioactive waste.

We have had a very extensive dialog going on in the State of New Mexico for some time, so we think that we are very aware, we are very interested in the discussions that you are going to have this morning and the alternatives, because it is going to be a problem that we are going to deal with from now on.

I thank you, Mr. Chairman, for the time.

Mr. GORE. Congressman Harold Volkmer.

Mr. VOLKMER. Thank you, Mr. Chairman.

I want you and the rest of the committee to know of my full support in calling these hearings today and examining the alternative technologies for disposing of hazardous waste which is posing a threat to our health today.

As we review the news these days, it seems that each day more problems are discovered with a new substance in a different area requiring Superfund involvement. The answer to these problems is a safe and permanent disposal, the issue we will hear about from these witnesses.

Additionally, I am pleased we have with us today the deputy director of the Missouri Department of Natural Resources, Ron Kucera. This is a lead agency for handling what has become known as the dioxin crisis in Missouri. Ron is familiar with all the aspects of how Missouri is approaching the problem.

I must admit I have had many differences with the EPA and with the state in the aspects of the way the problem has been handled. However, when one realizes the magnitude of the problem in Missouri, we realize that only by working together can the problem be solved.

I think it is important that Ron is here today, as he will be able to address the specific problems Missouri has had and is continuing to face in resolving the problem. I know we all want a safe and permanent cleanup of dioxin-contaminated soil, but how to reach that

goal has eluded us thus far. I am sure Ron will have some comments on these reasons.

Within my congressional district in Missouri is the only licensed hazardous waste landfill. However, it has not been licensed for dioxin. I may have some disagreement with the chairman on the statement just made about dioxin being able to be placed in any landfill, because according to our research, it needs to be licensed under either TSCA or RCRA as presently proposed in regulations. There is some question about the suitability of this landfill for dioxin. The matter is currently in court in Missouri.

Also within my district are several dioxin-contaminated sites. I also would like to mention, as Ron knows, that my district is also a large, low-level radioactive waste site, the largest in the State of Missouri. Not only do I want to see the contaminated sites cleaned up as quickly as possible, but also by treating dioxin in such a way that it poses no health hazard. Landfilling is not an option, as far as I am concerned.

I know Ron has been involved in attempting to find such a solution. I think his contribution to these hearings in an attempt to find an alternative will be interesting in revealing it to us today.

I would like to say also that my SSA subcommittee, of which I am chairman, is conducting hearings on the commercialization of space activities this morning. I may have to be absent for part of these hearings. This does not indicate my lack of interest or concern for this problem of disposing of hazardous wastes.

Thank you, Mr. Chairman.

Mr. GORE. Thank you. Might I say that I don't think we are in disagreement on the matter to which you referred. What I was saying in my statement is that although EPA has proposed to regulate dioxin, currently it is not doing so, and I think we are both agreed that it should.

Our first panel consists of William Wallace, Director of Solid and Hazardous Waste Management at the CH2M Hill Company; Dr. Gary Sayler of the Department of Microbiology and the Graduate Program in Ecology at the University of Tennessee in Knoxville, and I want to add a special welcome to Dr. Sayler, as a fellow Tennessean; and Ron Kucera, deputy director of the Missouri Department of Natural Resources.

Mr. Wallace's company, CH2M HILL, has vast experience in dealing with PCBs and dioxins. Dr. Sayler has conducted extensive research into biological treatments for hazardous waste, with a particular emphasis on PCBs, and Mr. Kucera has been intimately involved with the problem of dioxin in Missouri.

We will begin with you, Mr. Wallace, if you could lead off. Without objection, your entire statement and those of our other witnesses will be included in full in the record. If you care to summarize any of your statement, feel free to do so.

STATEMENTS OF WILLIAM WALLACE, DIRECTOR, SOLID AND HAZARDOUS WASTE MANAGEMENT, CH2M HILL, INC.; GARY SAYLER, DEPARTMENT OF MICROBIOLOGY, UNIVERSITY OF TENNESSEE; AND RON KUCERA, DEPUTY DIRECTOR, MISSOURI DEPARTMENT OF NATURAL RESOURCES

Mr. WALLACE. Thank you, Mr. Chairman. I will summarize.

Mr. Chairman and members of the subcommittee, thank you for this opportunity to present our views regarding solid and hazardous waste management.

CH2M Hill is the seventh largest consulting engineering firm in the United States. We are an employee-owned firm of approximately 2,100 people. CH2M Hill has long been one of the leaders in helping to develop the technology to clean up our Nation's waters and is now heavily involved in developing solutions to hazardous waste problems.

My remarks today concern the treatment technologies in hazardous waste management that are alternatives to land disposal. At CH2M Hill we have studied many chemical, physical, and biological treatment systems for solid and hazardous waste, air pollutants, and wastewater. We are currently investigating the feasibility of a number of alternative treatment, storage, and disposal options for dioxin-contaminated soils.

My purpose today is twofold. First, I will show that there are many alternative technologies available to manage hazardous wastes. These technologies can destroy or significantly reduce the hazardous characteristics of wastes, a superior approach than the long-term containment approach offered by landfilling.

My second purpose, however, is to post some warning signs as we proceed along this route to alternative technologies. While these technologies hold significant promise, there are definite limits on when and under what conditions they can be used to treat hazardous waste. We believe that the correct way to employ these alternative technologies is to use the right selection, design, and engineering procedures to insure that the technology is applied correctly to the appropriate problem.

In these remarks I will discuss some of our experiences with managing two wastes of particular interest polychlorinated biphenyls and dioxins. I will also provide recommendations on ways to remove impediments to the development of alternative technologies.

Polychlorinated biphenyls are a class of chemical compounds which, because of their unique properties, found widespread use in transformers, paints, paper, and in numerous commercial products. PCB's were found to be hazardous to human health and the environment.

While PCB's are resistant to decomposition, liquids and some PCB solids can be incinerated. In addition, there are chemical treatment processes that have been designed to reduce the level of PCB contamination in transformer oils. These processes reduce the PCB contaminant levels to less than one part per million, allowing the treated fluids to be safely reused.

The most difficult disposal problems with PCB's are the reduction or elimination of PCB contamination in soil or other complex

matrices. PCB's tend to bind tightly to the soil, making them difficult to remove.

Dioxin is the name of a family of organic chemical compounds which are found as impurities generated during the manufacture of certain pesticides. While there are 75 possible dioxin structures or isomers, the major health and environmental interest has focused on the 2,3,7,8 tetrachlorodibenzo-p-dioxin isomer, or TCDD.

The TCDD isomer has been named the most toxic synthetic chemical compound known to man. Other dioxin isomers show varying degrees of toxicity, but none match the toxicity of TCDD. Unlike PCB's, there are no beneficial uses for any of the dioxins.

Because of its severe toxicity and its distribution in the environment, the proper management of TCDD contamination presents some very difficult engineering problems. In a pure form or in a solvent matrix, TCDD can be destroyed. Incineration or other thermal treatment processes would likely be effective. Like PCB's, TCDD has been shown to bind tightly to soils. Reduction of TCDD in soils to low levels, in the one part per billion range, presents an enormous technical challenge.

From our own in-house experience and discussions with other engineers and scientists we have identified well over 100 alternative treatment processes applicable to PCB's and TCDD. I will summarize for you some of these processes and then share with you some of our thoughts and experiences in dealing with TCDD-contaminated soils. In our view, this represents the most technically difficult problem and one which is of current concern.

Treatment and disposal alternatives can be grouped into general classes of processes or technologies. Extraction and concentration processes are intermediate processes that can remove or alter the wastes. They must be coupled to another process to degrade, destroy or otherwise manage the contaminants. Solvent extraction, for example, might remove the PCB or TCDD from a soil matrix. The resulting solution might then be concentrated by distillation and destroyed by incineration.

Degradation processes such as incineration, ultraviolet light treatment, molten salt combustion or chemical dechlorination are processes which degrade the contaminants to levels which are considered safe or more easily managed. PCB's can be incinerated. PCB contamination in oils can also be reduced using commercially available dechlorination processes.

For a better perspective on the application of alternative technologies, I will compare some approaches to managing TCDD-contaminated soils, some using land disposal, some using treatment.

Under an EPA contract, CH2M Hill has studied various approaches for dealing with TCDD-contaminated soil. We compared six alternatives, using a recommendation of one part per billion as the acceptable concentration level of TCDD in the residue. Of the six alternatives, three involved fixation and land disposition with long-term monitoring and maintenance; in other words, land disposal.

The fourth alternative, incineration of the soil, involves a number of handling and processing steps to get the soil materials into a form that could be efficiently incinerated. Resulting inciner-

ator particulates and soil residue would require disposal or long-term storage.

Solvent extraction and incineration was the fifth alternative. In this approach, a multistage solvent extraction system would be set up to extract TCDD from the soil matrix. Once completed, the TCDD-contaminated solution would be incinerated.

As a sixth alternative, we consider interim storage of contaminated soils, awaiting the development of new technologies for TCDD degradation.

For this waste-management problem the central issue is this: What is the relative tradeoff between the long-term risks and costs of land disposal versus the short-term risks and costs of alternate technologies? The land disposal options may be simpler to implement, but they must be continuously monitored and maintained.

The use of the alternative technologies options include excavation and processing of soils, which may pose additional risks during the waste-handling-and-processing steps, plus higher costs for facilities. However, the problems of long-term residuals management for these options appear to be far less than those presented by the land disposal options.

The size of the facilities needed to process the soils and to extract and incinerate the TCDD-contaminated materials may become a factor. In conducting this analysis we found that the size of the facilities needed to process and incinerate a quantity of TCDD-contaminated soil at a disposal site were quite large, on the order of a medium-sized chemical plant.

Though each waste-management problem is different, it is important to realize what the cost and environmental impacts might be when selecting a waste-management alternative.

From our analysis we have developed some conclusions which I hope will assist you in your efforts.

First, PCB's and TCDD-contaminated wastes can be destroyed by incineration and other treatment technologies, but the practicality of these technologies depends on the quantity and composition of the particular waste under consideration.

Second, several major impediments to the development and utilization of alternative technologies exist:

(*a*) Many, if not most, of these technologies are at the conceptual stage or in the early stages of development, requiring substantial effort to develop them to a commercial scale.

(*b*) For hazardous wastes listed under RCRA, there is little incentive to employ alternative technologies. The use of a treatment process does not reduce the regulatory requirements, even if the waste treated is rendered harmless.

Today, under RCRA regulations, listed wastes treated by an alternative technology are still classified as hazardous wastes. To get declassified as a hazardous waste, the company using the technology must get its processed waste delisted. This delisting process is a rulemaking procedure under RCRA and takes many months to execute.

(*c*) The public mistrusts any hazardous waste-management alternative. Public opposition to hazardous waste-management facilities is a common occurrence. This opposition is not limited to land disposal facilities but is aroused by waste-treatment facilities as well.

It is our belief that this public mistrust is an outgrowth of the current outcry over the uncontrolled sites uncovered under the Superfund program. Although many of these sites are orphaned sites, a significant number are turning out to be facilities that claimed to be conducting adequate waste treatment, storage, and disposal.

We offer some recommendations for encouraging the use of alternative technologies for hazardous waste management:

First, change the Resource Conservation and Recovery Act so that land disposal is disallowed when a practical alternative exists.

Under the current law, EPA must allow land disposal of any waste, except free liquids and ignitables, if the disposer can show that he can manage them safely. This proposed legislative change would shift the burden of proof to the disposer to show not only that the wastes can be safely landfilled, but that treatment is not available or feasible.

Recently some States have taken steps to alter this regulator approach in favor of a more prescribed method for selecting the waste-management alternatives. Under this concept, the waste generator must show that waste-management options other than land disposal have been addressed and found unacceptable.

California has issued a schedule for banning specific types of wastes from landfills. Some legislators have recommended Federal legislation banning the land disposal of certain wastes.

Second, modify the current delisting procedure to allow hazardous waste-management controls to be removed from properly treated listed wastes.

EPA must develop additional tests for hazardous waste characteristics in order to provide a quick and practical test for determining whether treated wastes have been rendered nonhazardous. Once rendered nonhazardous, regulatory controls should be dropped.

We understand that EPA is now developing this test. This work and subsequent rulemaking should proceed as quickly as possible. The State of Washington now has some rules in effect. Unfortunately, these rules are designed to bring more waste under control but not to provide a method of exemption for treated wastes. Once promulgated, engineers and scientists could use the test criteria to design and development treatment processes.

Fourth, provide for increased public awareness and involvement in hazardous waste management decisions.

Any treatment or disposal methods developed will undergo intense public scrutiny. Further, it is clear that continuing public opposition to a technical solution will reduce or eliminate any chance of implementation. We strongly recommend frequent and substantive contact with the public in these matters in order to foster an open exchange of ideas, views and objections.

Mr. Chairman and members of the committee, I wish to thank you for this opportunity to express my views on this very important subject. I would be pleased to respond to any questions.

[The prepared statement of Mr. Wallace follows:]

CH2M
HILL
engineers
planners
economists
scientists

STATEMENT

of
William A. Wallace
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before
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C.

May 4, 1983

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to present our views regarding hazardous waste treatment, storage, and disposal techniques. My name is William Wallace. I am Director of Solid and Hazardous Waste Management for CH2M HILL.

CH2M HILL is the seventh largest consulting engineering firm in the United States. Our staff of approximately 2,100 employees in over 36 offices world wide has been providing clients in the public and private sectors with comprehensive services in engineering, planning, economics and the environmental sciences since 1946. The firm provides assistance in a wide variety of fields, including water, waste management, hazardous waste, agriculture, energy, transportation and general civil engineering. CH2M HILL has long been one of the leaders in helping to develop the technology to clean up our nation's waters and is now heavily involved in hazardous waste activities. This environmentally-oriented firm is unusual in that it is employee owned.

OVERVIEW

My remarks today concern the treatment technologies in hazardous waste management that are alternatives to land disposal. At CH2M HILL we have studied many chemical, physical, and biological treatment systems for solid and hazardous waste, air pollutants, and wastewater. We are currently investigating the feasibility of a number of alternative treatment, storage, and disposal options for dioxin-contaminated soils.

My purpose today is twofold. First I will show that there are many alternative technologies available for management of hazardous wastes. These technologies can destroy or significantly reduce the hazardous characteristics of wastes--a superior approach than the long-term containment approach offered by landfilling. My second purpose, however, is to post some warning signs as we proceed along this route to alternative technologies. While these technologies hold significant promise, many are still in the conceptual stage or in the early stages of development. There are definite limits on when and under what conditions these technologies can be used to treat hazardous waste. In many cases, we simply do not know what these limits are.

The correct way to employ these alternative technologies to manage hazardous waste is to use the right selection, design, and engineering procedures to ensure that the technology is applied correctly to the appropriate problem. Clearly in this time of great concern over hazardous waste, we must avoid to the extent possible the misapplication of a technology or, worse, the application of "snake oil" solutions to today's critical health and environmental problems.

In these remarks, I will discuss some of our experiences with managing two wastes of particular interest: polychlorinated biphenyls (PCBs) and dioxins. I will also provide recommendations on ways to remove the impediments to development of alternative technologies.

POLYCHLORINATED BIPHENYLS

Polychlorinated biphenyls (PCBs) are a class of chemical compounds which because of their unique properties found widespread use in transformers, capacitors, hydraulic fluids, paints, paper, and in numerous commercial products. Unfortunately, PCBs were found to be hazardous to human health and the environment. Tests show that PCBs can cause long term toxic effects on animals and humans. Ironically some of the properties that made PCBs commercially attractive--chemical stability and resistance to decomposition--are the same properties that make them harmful in the environment.

PCBs are known to cause eye, nose, and throat irritation and chloracne, a skin rash resembling teenage acne. PCBs may also cause liver damage, adverse reproductive effects, and cancer. In 1968 over 1,200 Japanese were exposed when rice-oil used in cooking was contaminated with PCBs. Eight years later, many still exhibited chloracne, arm and leg numbness, and menstrual and digestive disturbances. A study of deaths in the years following the exposure found an excessive number of cancers of the stomach, liver, lungs, and breast.

Animal studies of PCB toxicity vary in reported toxicity levels due to the many isomers of PCB tested. The lethal dose ranges from 1,295 to 16,000 parts per million body weight in rats with oral administration and 1,269 to 3,169 parts per million body weight in rabbits with skin applications. Death is generally caused by massive liver damage. Liver tumors and adverse reproductive effects have also been found in animal studies.

PCBs are regulated under the Toxic Substances Control Act which provides marking and disposal requirements for PCB liquids, articles, and mixtures. Additional rules ban the manufacture, sale, and use of PCBs except in a totally enclosed environment. These rules are unique in that they prescribe the manner in which PCB wastes can be handled and define a "non-hazardous" level of PCB contamination. PCB chemical substances, for example, must be incinerated in approved incinerators. PCB mixtures are regulated when they have PCB levels exceeding 50 parts per million (ppm).

While PCBs are resistant to decomposition, liquids and some PCB solids can be incinerated. In addition, there are chemical treatment processes that have been designed to reduce

the level of PCB contamination in transformer oils. These processes reduce the PCB contaminant levels to less than 1 part per million, allowing the treated fluids to be safely reused.

The most difficult disposal problems with PCBs generally involve the reduction or elimination of PCB contamination in soil or other complex matrices. PCBs tend to bind tightly to the soil, making them difficult to remove.

DIOXINS

Dioxin is the name of a family of chemical compounds which are found as impurities generated during the manufacture of certain pesticides. While there are 75 possible dioxin structures, or isomers, the major health and environmental interest has focused on the 2,3,7,8 tetrachlorodibenzo-p-dioxin isomer, TCDD. TCDD has been named the most toxic synthetic chemical compound known to man. Other dioxin isomers show varying degrees of toxicity, but none match the toxicity of TCDD.

Unlike PCBs, there are no commercially beneficial uses for any of the dioxins. They are inadvertant impurities generated during the manufacture of chlorophenols used in pharmaceuticals such as hexachlorophene, herbicides such as 2,4,5-T, and fungicides such as the wood preservative pentachlorophenol. The number of dioxin isomers generated depends upon process controls such as temperature and pressure. Chemical wastes and sludges from these manufacturing processes may be significant environmental sources of dioxins if not properly managed. Dioxins have also been detected in combustion processes.

One characteristic of dioxins is their extreme persistence in the environment. With the powerful new analytical techniques being developed, it is now possible to identify dioxins at the part-per-trillion level. Indeed, dioxins are being detected in numerous environmental samples, which shows the persistence and prevalence of these compounds.

Most concern about dioxins focuses on TCDD; this paper discusses the toxicity of this isomer only. In animal studies, TCDD, has been shown to cause death in dogs at a level of 3 parts per million (ppm) body weight; in monkeys at 70 parts per billion (ppb) body weight; in rabbits at 10 ppb; and in guinea pigs at 0.6 ppb when administered orally. Dioxin can also be absorbed through skin. Tests with rabbits have shown that the lethal dose via this route is 275 ppb, which, although it is about 25 times the oral route, is still extremely potent. Death in these toxicity studies is generally a result of massive liver destruction and can occur several

weeks after exposure to a toxic dose. Perhaps of even greater concern is the toxic effects of TCDD on the developing fetus. Oral doses administered to pregnant monkeys produced birth defects and fetal death at levels as low as 0.2 ppb body weight. It has also produced fetal death or birth defects in animal studies of pregnant rats and mice. In addition, several studies have indicated the cancer-causing potential of TCDD.

Studies of human exposure are ambiguous with respect to toxicity. The most commonly reported effect is chloracne, a condition similar to teenage acne on the face, neck and back. This may appear weeks or even months after exposure. Other reported effects include symptons of irritation such as a burning sensation in eyes, nose and throat and redness and swelling of eyelids, nose, and lips, as well as other symptons such as aching muscles, insomnia, extreme irritability, loss of sexual drive, neuropsychiatric disorders, progressive weight loss, and liver damage. The only reported deliberate exposure to TCDD involved three scientists who were self-exposed. The only effect shown by all three was increased cholesterol levels. Two developed chloracne eight weeks after exposure, and 2 years later, two showed personality changes, impairment of vision, taste and muscular coordination, sleep disturbances, and gastrointestinal disturbances.

Studies of occupationally exposed workers have not demonstrated any increased mortality, even among workers who showed symptoms of chloracne. Extensive studies of the area around Seveso, Italy following an accidental release of dioxin from a pharmaceutical plant in 1976 have found 132 children, out of 32,000 screened, who had chloracne. Among the adults who lived in the most highly contaminated zone, 30 percent showed enlarged livers. These findings are being further researched. Interestingly in light of animal studies of fetotoxicity, no increase in birth defects or spontaneous miscarriage has been reported in this area. In other studies, birth defects were reported among mothers employed as hospital nurses exposed to hexachlorophene soap during early pregnancy. The hexachlorophene was contaminated with TCDD, although other chemical contaminants were present as well. Complaints of spontaneous abortion and birth defects among women exposed to 2,4,5-T spraying in South Vietnam and in rural Oregon are still under investigation.

In summary, animal studies predict a severe toxic response to TCDD, but the human experience is less definitive. The EPA and Center for Disease Control have recommended a level of 1 ppb for TCDD in soils at several dioxin-contaminated sites.

On April 4, 1983, EPA proposed a rule under the Resource Conservation and Recovery Act covering dioxin-contaminated wastes including TCDD. These wastes were labeled as acutely hazardous wastes and subject to special disposal requirements.

Because of its severe toxicity and its distribution in the environment, the proper management of TCDD contamination presents some very difficult engineering problems. In a pure form or in a solvent matrix, TCDD can be destroyed. Incineration or other thermal treatment processes would probably be effective. Unfortunately, TCDD is usually a trace contaminant of another compound or a trace contaminant in soil. Like PCBs, TCDD has been shown to bind tightly to soils. However, recommended TCDD contaminant levels in soils are in the range of 1 part per billion. Removal of TCDD from soils to this concentration presents an enormous technological challenges

TREATMENT TECHNOLOGIES

Overview

In general there is a wide variety of treatment alternatives that are applicable to the treatment or disposal of PCBs and TCDD. Some of these are commerically available, while some are in the early stages of development.

At this point, I would like to place some warning signs before you regarding our approach to utilizing alternative technologies. Each of these alternatives generally has application to a limited variety of wastes or wastes with a specific range of physical and chemical characteristics. This fact should not detract from our efforts to utilize these technologies. Rather, it points to the need for some careful engineering analysis prior to any major commitment of effort to one particular technology (see Figure 1). While the developers of new technologies have good intuition about the applications of their technologies, processing facilities cannot be built on intuition alone. Good design and engineering data must be available in order to scale up to a commercially-usable process.

CH2M HILL is familiar with the problems of employing alternative technologies because of our extensive experience in developing and incorporating new wastewater treatment technologies into pollution control facilities. It appears to us that technology for hazardous waste treatment is in much the same state as that of the wastewater treatment technologies under the Clean Water Act. Over the last 10 years, the many claims for waste treatment process applications and technical performance were systematically replaced with

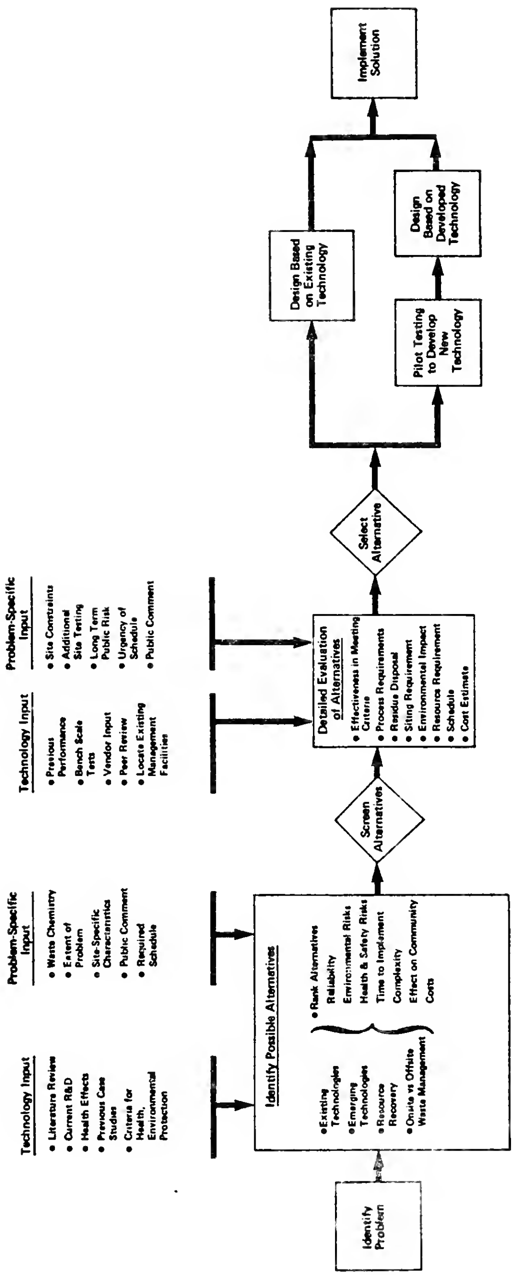

FIGURE 1
ROLE OF ENGINEERING
IN HAZARDOUS WASTE MANAGEMENT

sound technical data developed from good engineering work. This evolutionary process (see Figure 2) is also expected to occur as hazardous waste programs mature.

During this evolution of technology for hazardous waste, we should expect to make mistakes. Making mistakes is one way in which engineers learn how to correctly apply the technology. This is acceptable as long as the mistakes are not too costly in terms of dollars and in terms of health or environmental problems. However, we must remember that previous hazardous waste management efforts have already had their share of mistakes. As a result of these mistakes, the public has strongly opposed efforts to try new technical solutions. It is clear that we need some early successes if we expect to reverse this opposition.

Technologies for PCB and TCDD Treatment or Disposal

From our own experience and discussions with other engineers and scientists, we have identified well over 100 alternative treatment processes applicable to PCBs and TCDD. I will summarize for you some of these processes and then describe some of our thoughts and experiences from our evaluation of various alternatives for treating and disposing of TCDD-contaminated soils. In our view, TCDD disposal represents the most technically difficult problem and one which is of current concern.

Treatment and disposal alternatives can be grouped into general classes of processes or technologies (see Table 1). "Fixation" processes are processes which bind the waste in a matrix that resists extraction or leachate migration of contamination. These processes contain the wastes and do not degrade the contaminants. Hence they are a form of land deposition.

"Extraction" and "concentration" processes are intermediate processes that can remove or alter the wastes. They must be coupled to another process to degrade, destroy, or otherwise manage the contaminants. Solvent extraction, for example, might remove PCB or TCDD from a soil matrix. The resulting solution might then be concentrated by distillation and destroyed by incineration.

"Degradation" processes such as incineration, ultraviolet light treatment, molten salt combustion, or chemical dechlorination, are processes which degrade the contaminants to levels that are considered safe or more easily managed. PCBs can be incinerated. PCB contamination in oils can also be reduced using commercially available dechlorination processes.

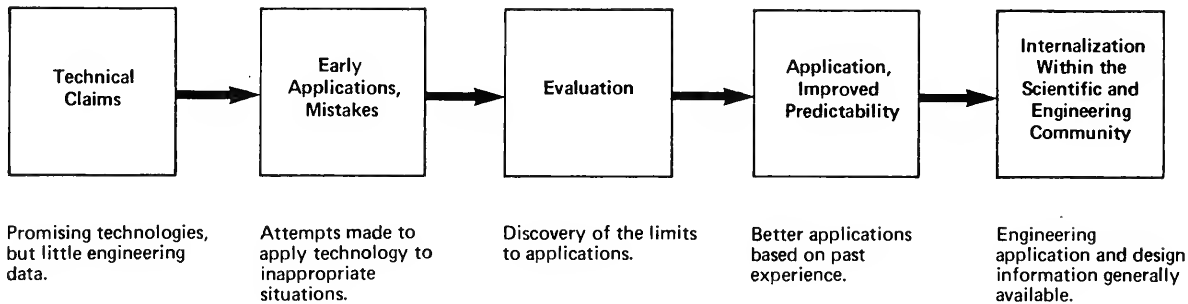

FIGURE 2
EVOLUTION OF TECHNOLOGY
APPLICATION TO NEW PROBLEMS

TABLE 1
DIOXIN PROCESS/TECHNOLOGY SUMMARY

Process/Technology	Description	Fate of Dioxin	Byproducts	Commercial Status
FIXATION				
1 Organic polymer	Soil containing TCDD is mixed with an organic polymer which hardens	TCDD and soil are bound together	None	Used routinely on commercial scale for soil; no TCDD experience
2 Inorganic with cement, fly ash, or ceramic	Soil containing TCDD is combined with portland cement or fly ash Moisture is added as required to cause the mixture to set	TCDD and soil are bound together	None	Used routinely on commercial scale for soil, no TCDD experience
3 Carbon	Soil containing TCDD is mixed with activated carbon Free or uncomplexed TCDD is adsorbed on the carbon	TCDD in soil and TCDD on carbon are mixed together	None	Conceptual
4 Encapsulation	Soil containing TCDD is enclosed in a barrier of low permeability such as high density polyethylene	TCDD and soil are enclosed	None	Commonly used for encapsulation of hazardous waste
SECURE IN PLACE	Securing the site and capping with bentonite clay	TCDD remains on-site in secured location	None	Demonstrated on industrial scale
IN-SITU DEGRADATION				
1. Ultraviolet degradation	A suitable hydrogen donor (preferably non-toxic and non-volatile) is applied to the soil followed by irradiation with sunlight or high-pressure mercury lamps	Soil remains in place, TCDD is degraded; TCDD may be spread by the solvent	Soil contains TCDD decomposition products	Tried at Seveso with limited success
2 Chemical degradation	A chloroiodide micellar solution is applied to the soil and the ether bonds of the TCDD are cleaved	Soil remains in place, TCDD is degraded	Soil contains TCDD decomposition products	TCDD in a 100g sample of Seveso soil has been 52% degraded in a laboratory test
EXTRACTION				
1 Solvent	Soil is processed to enable extraction with solvent and then TCDD is extracted from soil with solvent in either a batch or continuous operation.	TCDD in solvent	Soil containing solvent	Bench-scale experience only with soil but commercial experience with sludge from distillation bottoms at Verona
2 Steam stripping	TCDD is volatilized from soil by contacting with steam.	TCDD with water as insoluble phase	Possible TCDD thermal decomposition products	Conceptual
CONCENTRATION				
1 Adsorption, carbon	Solvent containing TCDD is passed through activated carbon	TCDD is adsorbed on carbon	TCDD free solvent	Pilot testing on herbicide orange
2 Adsorption, resin	Solvent containing TCDD is passed through resin.	TCDD is absorbed on resin	TCDD free solvent	Laboratory tested to remove pesticides from wastewater; conceptual only for TCDD
3. Distillation	Solvent is distilled and TCDD is concentrated in the distillation bottoms	TCDD in distillation bottoms	TCDD free solvent	Commercially used in pesticide manufacturing process; also done at Verona
4. Membrane processing	Selective passage of solvent through a membrane, as in reverse osmosis or ultra-filtration.	TCDD concentrated in solvent	TCDD free solvent	Conceptual

TABLE 1
DIOXIN PROCESS/TECHNOLOGY SUMMARY (continued)

Process/Technology	Description	Fate of Dioxin	Byproducts	Commercial Status
DEGRADATION				
1 Radiation treatment				
a UV degradation	TCDD is irradiated with sunlight or high pressure mercury lamps in the presence of a suitable hydrogen donor after solvent extraction from soil TCDD in solvent is irradiated with gamma radiation	TCDD degradation	Solvent with TCDD decomposition products	Commercially done at Verona
b Gamma	TCDD in solvent is irradiated with gamma radiation	TCDD degradation	Solvent with TCDD decomposition products	Laboratory tests on TCDD in solvent
2 Chemical Treatment				
a Catalytic dechlorination	TCDD in solvent is dechlorinated with Nickel Borohydride catalyst	TCDD degradation	Solvent with TCDD decomposition products	Conceptual
b Chlorination	TCDD in solvent is extensively chlorinated between 600 and 800° C and 150 psig	TCDD degradation	Solvent with TCDD decomposition products of CCl_4, HCL, and $COCl_2$	Piloted on herbicide orange
c Ruthenium tetroxide	TCDD in solvent is oxidized with ruthenium tetroxide	TCDD degradation	Solvent with TCDD decomposition products	Laboratory tests only
d Chloroiodides	TCDD is reacted with chloroiodides in a micellar solution	TCDD degradation	Solvent with TCDD decomposition products	Laboratory tests only
e Ozone/UV	TCDD in solvent is reacted with ozone and irradiated with ultraviolet light	TCDD degradation	Solvent with TCDD decomposition products	Laboratory tests only
f Chemical dechlorination	TCDD is reacted with an aromatic liquid and alkaline reactants	TCDD degradation	Solvent with TCDD decomposition products	Laboratory tests only
3 Thermal Treatment				
a Wet air oxidation	TCDD is catalytically oxidized at 200° C in a wet air oxidation process	TCDD degradation	TCDD decomposition products	Laboratory tests with TCDD
b Conventional hazardous waste incineration	TCDD in soil or solvent is combusted in a hazardous waste incinerator	TCDD degradation	TCDD decomposition products	Commerical incineration available for PCB's. other hazardous wastes. TCDD incinerated with herbicide orange on the M/T Vulcanus
c Molten salt combustion	TCDD in solvent is injected below the surface of a molten salt bath in a reactor at 1500° F to 1800° F	TCDD degradation	TCDD decomposition products, spent molten salt melt	Laboratory tests with chlorinated hydrocarbons
d Microwave-plasma destruction	TCDD in soil or solvent is mixed with partially ionized gas produced by microwave-induced electron reactions.	TCDD degradation	TCDD decomposition products	Pilot-scale tested on PCB's and other toxic products materials
e Pyrolysis	TCDD in soil or solvent is decomposed by heat alone	TCDD degradation	TCDD decomposition products	Conceptual

Comparison of Alternatives for Management of TCDD-Contaminated Soils

For a better perspective on the application of alternative technologies, I will compare several approaches to managing TCDD-contaminated soils; some use land disposal and some use alternative treatment technologies. CH2M HILL has studied many alternative approaches to dealing with TCDD-contaminated soil under an EPA contract. We compared six alternatives using a recommendation of 1 part per billion as the acceptable concentration of TCDD in the residue.

Figure 3 presents our overall concept for managing TCDD-contaminated soil through the final deposition of residuals. We considered two major strategies:

1. In-place fixation of the contaminated soil to contain the TCDD and reduce potential exposure

2. Removal and treatment to reduce the dioxin level

It is important to note that all alternatives required land disposal of the residuals.

Figure 4 presents the waste handling and process steps necessary to manage the TCDD-contaminated soil. These alternatives are described below.

Alternative A. Secure In-Place. This alternative would involve in situ soil fixation, a perimeter grout curtain, an impermeable cap over the contaminated area, and diversion of surface runoff. A long-term site monitoring and maintenance program would be implemented to monitor the groundwater and surrounding environment.

Alternative B. Consolidate Onsite Above Ground. This alternative includes removal of contaminated soil and consolidation into one area onsite. It is assumed that an above-grade concrete vault would contain the contaminated soil. A long-term site monitoring and maintenance program would also be provided.

Alternative C. Secure Offsite. This alternative involves removal of the contaminated soil and transportation to a secure hazardous waste landfill for disposal. The removed soil volume and up to 2 feet of additional fill would be added to restore the site drainage and to cover any fugitive trace of contaminated soil.

Alternative D. Incinerate Soil. This alternative includes removal of the contaminated soil (as in Alternative C), and storage of it onsite or offsite in a concrete vault while an

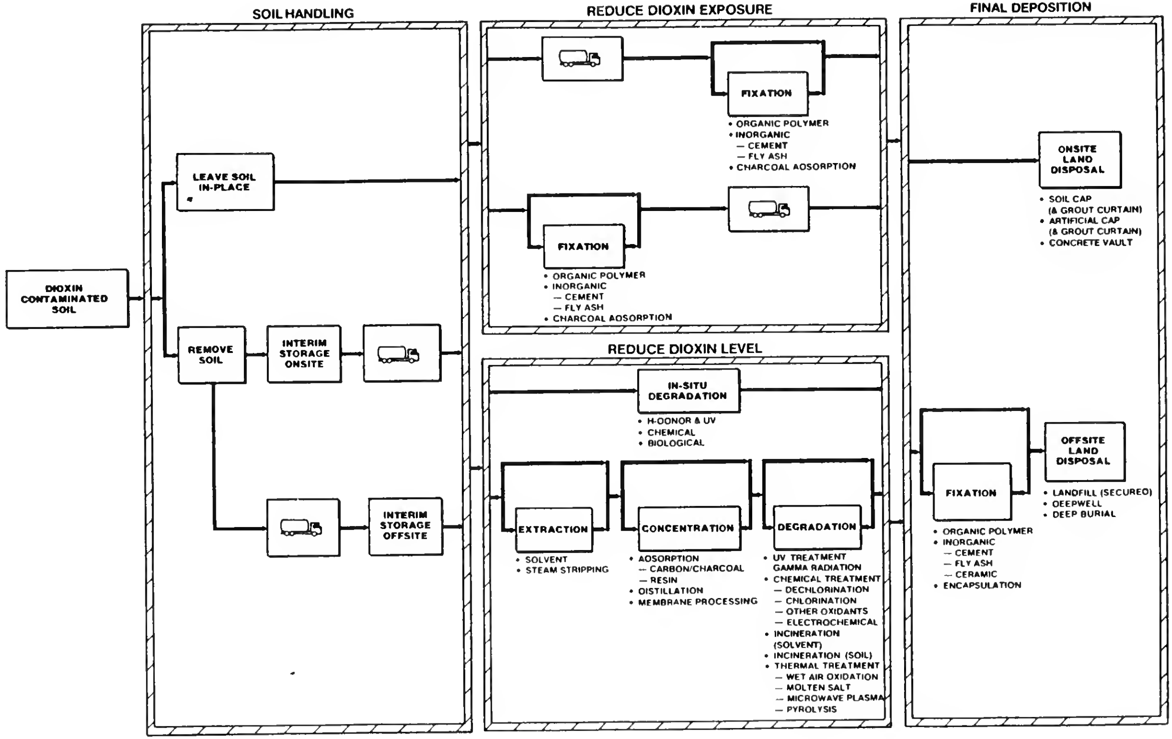

FIGURE 3
DIOXIN DISPOSAL OPTIONS

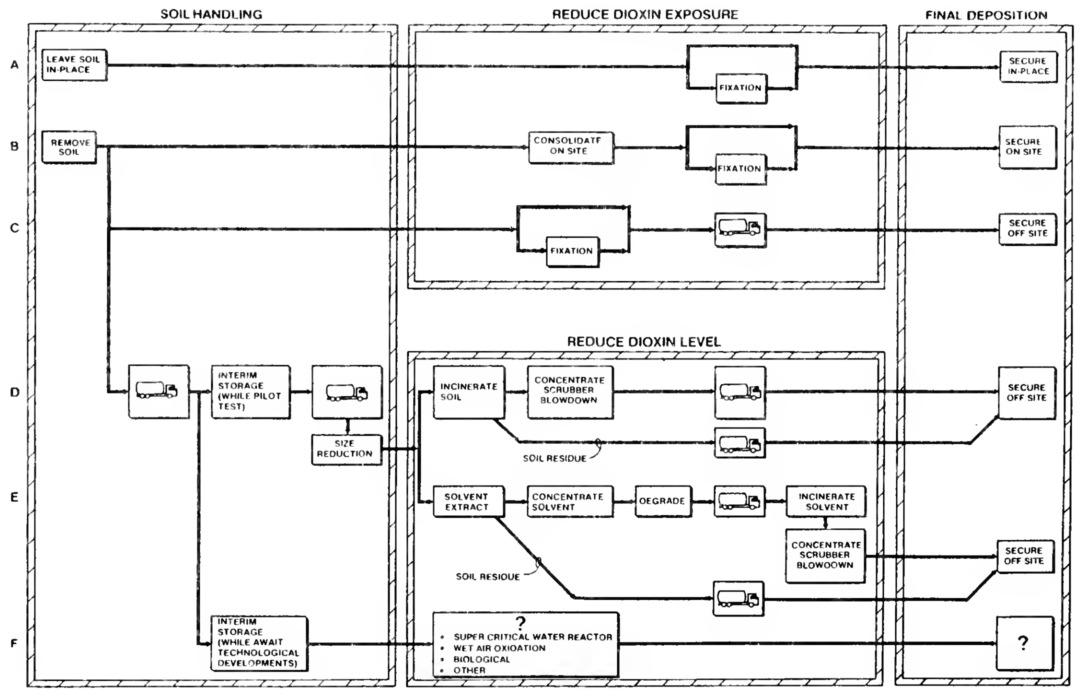

FIGURE 4
PARTIAL LIST
OF ALTERNATIVE COURSES OF ACTION

incineration process is pilot tested and developed. A significant permitting effort may be necessary for the siting of a full-scale facility. Following the permitting process and the construction of the facility, the soil would be transported to a size reduction and processing facility, and then to an incinerator. The incinerator particulates and soil residue would be transported to a secure landfill site unless careful testing is able to prove them free of TCDD contamination. The removed soil volume and up to 2 feet of additional fill would be added to restore the site drainage and to cover any trace of contaminated soil.

Alternative E. Solvent Extraction. This alternative involves removal of the contaminated soil and storage of it onsite or offsite in a concrete vault (as in Alternative C) while a solvent extraction process is pilot tested and developed for this particular contaminated soil. A significant permitting effort may also be necessary for the siting of a full-scale facility. Following the permitting process and the construction of this state-of-the-art process, the soil would be transported to a size reduction and processing facility, and then to the solvent extraction process. The resulting contaminated solvent would then be concentrated, with the concentrate next undergoing degradation and incineration. The incinerator particulates and the soil residue would be sent to a secure landfill site unless extensive testing proves them TCDD-free. The removed soil volume and up to 2 feet of additional fill would be added to restore the site drainage and to cover any trace of contaminated soil.

Alternative F. Store While Awaiting Emerging Technologies. This alternative includes removal of the contaminated soil and interim storage onsite or offsite until emerging technologies are developed and shown to be competitive with the other alternatives listed above. Emerging technologies could include super-critical water, wet air oxidation, and biological degradation.

The advantages and disadvantages of the alternatives are summarized in Table 2.

For the TCDD waste management problem the central issue is this: what is the relative trade-off between the long term risks and costs of land disposal versus the short-term risks and costs of alternate technologies? The land disposal options may be simpler to implement, but they must be continuously monitored and maintained. The alternative technologies options include excavation and processing of soils, which may present additional risks or costs in materials handling process development and facility construction. These problems of long term residuals management for these options appear to be fewer than those presented by the land disposal options, however.

Table 2
DIOXIN-CONTAMINATED SOIL ALTERNATIVES
LISTING OF ADVANTAGES/DISADVANTAGES

Alternative	Advantages	Disadvantages
A. Secure In-Place	Wastes stay in-place. No highway transport of wastes. Minimal cost.	Needs adequate site hydrogeology. Difficult to assure containment of wastes. Requires long-term monitoring. Requires site clearing and buffer zone.
B. Consolidate Onsite Aboveground	Wastes stay onsite. No highway transport of wastes. Positive containment. Not dependent on site hydrogeology.	Requires long-term monitoring. Requires site clearing and buffer zone.
C. Secure Offsite	Least site disturbance. Enables community restoration. Takes advantage of TCDD/soil binding.	Requires highway transport of wastes. Requires RCRA review and approval of site.
D. Incineration of Soil	Proven technology for many liquid and gaseous hazardous wastes. Equipment components readily available. Destroys dioxin vapors in afterburner.	Never done on dioxin contaminated soil. Requires process development. Risk of exposure. Requires large buffer zone. Requires solids disposal at secure landfill. Large commitment of resources. Requires wastewater treatment and disposal.

Table 2 (continued)
DIOXIN-CONTAMINATED SOIL ALTERNATIVES
LISTING OF ADVANTAGES/DISADVANTAGES

Alternative	Advantages	Disadvantages
E. Solvent Extraction	Demonstrated on bench-scale. Variety of solvents available. Dioxin in solvent may be reduced by photolysis, incineration, or dechlorination.	Never done on dioxin contaminated soil. Requires process development. Solvent toxicity. High risk of exposure. Requires very large buffer zone. Solids disposal at secure landfill. Large commitment of resources. Wastewater treatment and disposal.
F. Store While Awaiting Emerging Technologies	Encourages development of emerging technology.	Risk that emerging techology won't be competitive. May require long process development period. Superfund funding may be exhausted.

The size of the facilities needed to process the soils and to extract and incinerate the TCDD-contaminated materials may become a factor in the selection of treatment and disposal alternatives. In conducting our analysis we found that the size of the facilities needed to extract and incinerate about 8,000 cubic yards (1.6 acres, 3 feet deep) of TCDD-contaminated soil to the 1 part per billion range were quite large--on the order of an average size chemical plant covering 10 to 20 acres. Although each waste management problem is different, it is always important to determine the extent of the cost and environmental impacts when selecting a waste management alternative.

CONCLUSIONS

Because of the problems associated with land disposal, many new and old technologies have emerged as plausible alternatives for hazardous waste management. In reviewing the application of these technologies to specific wastes, we conclude that many offer major advantages over land disposal alternatives. Specific conclusions are offered below.

1. PCBs and TCDD-contaminated wastes can be destroyed by incineration and other treatment technologies, but the practicality of these technologies depends on the quantity and composition of the particular waste under consideration.

   In their pure states, PCB and TCDD can be effectively destroyed with existing commercial technology. However when these materials are mixed with other wastes or disposed in soil, it is considerably more difficult to ensure efficient destruction. These compounds are chemically stable and bind tightly to soils. Non-land disposal technologies may be useful in reducing or eliminating the hazards associated with these wastes, but each technology must be evaluated on a case by case basis. A similar conclusion can be drawn regarding other hazardous wastes.

2. Several major impediments to the development and utilization of alternative technologies exist:

   a. Many if not most of these technologies are at the conceptual stage or in the early stages of development, requiring substantial effort to develop them to a commercial scale.

      If a technology has not been tested, the costs and results of using the technology to manage wastes will be unpredictable. Claims made about the

efficiency or application of a technology must also be evaluated thoroughly before implementation.

b. For many hazardous wastes listed under RCRA, there is little incentive to employ alternative technologies. The use of a treatment process does not reduce the regulatory requirements, even if the waste is rendered harmless.

For many hazardous wastes there is currently no incentive for a generator to find an alternative treatment process. Today, under RCRA regulations, listed wastes treated by an alternative technology are still classified as hazardous wastes. To get the waste declassified as a hazardous waste, the company using the technology must get its processed waste delisted. Delisting is a rulemaking process under RCRA and takes many months to execute.

From our view as an engineering firm, it is now less of a risk to design and build a land disposal facility than to design and build an alternative treatment technology facility. The reason, simply stated, is that design and performance criteria for land disposal facilities exist in a usable form in the regulations. Except for incineration, no such criteria exist for alternative technologies.

c. The public mistrusts any hazardous waste management alternative.

Public opposition to hazardous waste management facilities is a common occurrence. This opposition is not limited to land disposal facilities, but is also aroused by waste treatment facilities as well. It is our belief that this public mistrust is an outgrowth of the current outcry over the uncontrolled sites uncovered under the "Superfund" program. Although many of these sites are "orphaned" sites, a significant number are turning out to be facilities that claimed to be conducting adequate waste treatment, storage, and disposal.

RECOMMENDATIONS

We have developed some specific recommendations for expanding the use of alternatives to land disposal. We at CH2M HILL firmly believe that alternative technologies for hazardous waste disposal should be used whenever possible. However, we do not believe that a ban on all land disposal activity is warranted. Land disposal or containment may be the only feasible remedy for many existing uncontrolled hazardous

waste sites, considering the costs and risks associated with waste removal and treatment.

Specific recommendations for encouraging the use of alternative technologies for hazardous waste management are below.

1. Change the Resource Conservation and Recovery Act so that land disposal is disallowed when a practical alternative exists.

   Under the current law, EPA must allow land disposal of any wastes (except free liquids or ignitables) if the disposer can show that he can manage it safely. This proposed legislative change would shift the burden of proof to the disposer to show not only that the wastes can be safely landfilled, but that treatment is not available or feasible.

   Recently, some states have taken steps to alter this regulatory approach in favor of a more prescribed method for selecting the waste management alternatives. Under this concept, the waste generator must show that waste management options other than land disposal have been addressed and found unacceptable. California has issued a schedule for banning specific types of wastes from landfills. Some legislators have recommended Federal legislation banning the land disposal of certain wastes.

2. Provide incentives for research and development of alternate technologies.

   The degree to which alternate technologies can be implemented depends largely on the availability of design and performance information. If this information is not available, it must be developed.

   Some land disposal sites are likely to become future "Superfund" sites. It is in the best interest of the government to provide incentives for technologies which, if applied, could avoid this future clean-up cost.

3. Modify the current "delisting" procedure to allow hazardous waste management controls to be removed from properly treated listed wastes.

   EPA must develop additional tests for hazardous waste characteristics in order to provide a quick and practical test for determining whether treated wastes have been rendered non-hazardous. Once rendered non-hazardous, regulatory controls should

be dropped. We understand that EPA is now developing this test. This work and subsequent rulemaking should proceed as quickly as possible. The State of Washington has such rules now in effect. Once these rules are promulgated, engineers and scientists could use the test criteria to design and develop treatment processes.

4. Provide for increased public awareness and involvement in hazardous waste management decisions.

   Any disposal methods developed will undergo intense public scrutiny. Further, it is clear that continuing public opposition to a technical solution will reduce or eliminate any chance of implementation. We strongly recommend frequent and substantive contact with the public in order to foster an open exchange of ideas, views, and objections.

Mr. Chairman, I wish to thank you and the Subcommittee for this opportunity to express my views on this important subject.

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to Greg Peterson and Mary Anne Chillingworth, who provided invaluable assistance in the preparation of this paper.

Mr. GORE. Thank you very much. We are going to hold our questions until all members of the panel have spoken. Next I would like to call upon my fellow Tennessean, Dr. Gary Sayler, from the Department of Microbiology at the University of Tennessee at Knoxville.

Dr. Sayler, we are delighted to have you here. Your discovery has been creating some excitement since you presented it at the American Society of Microbiology annual meeting in New Orleans. We are proud of the work that you have done. I think it can fairly be labeled a breakthrough, although many others are working in this field. This is an important development and a very significant step. We are pleased to have you here to tell us about it.

Mr. SAYLER. Thank you, Mr. Chairman, members of the committee.

I am going to deviate from my prepared text a little bit and just really discuss biological applications in terms of the ability of microorganisms to break down some potentially hazardous waste materials.

First, I would like to mention some aspects of our work at the University of Tennessee on biological decomposition, or biodegradation, of contaminating organic molecules, frequently termed "xenobiotic molecules." This includes things such as PCB and dioxin residues.

The work we have been conducting at the university has really been related to an EPA project to study the factors affecting the potential biological degradation of some of the chlorinated biphenyl molecules in reservoir sediments that have been contaminated by industrial waste.

Over the past several years we have isolated a number of bacteria that demonstrated some limited capability of degradation of the lower chlorinated PCB molecules. You must realize that PCB's are a class of chlorinated organic compounds with 210 different chlorinated residues. Most of the higher chlorinated compounds are nonbiodegradeable.

I think much of the research that has been conducted by various scientists in this country, Japan, as well as Germany, have indicated that PCB molecules with up to four chlorinated carbon atoms in a PCB compound can be subject to some moderate biological decomposition.

Above that, these molecules are virtually indestructible in terms of biological degradation. The main reason for this is that PCB molecules are truly xenobiotic molecules in that they are foreign to the natural environment. The result is, in evolutionary time, organisms have not been exposed to these toxic chemicals and they simply have not evolved enzymatic systems that deal with the biological decomposition.

Our approach recently has been to look at contaminated sediment systems, determine if organisms are there that carry out some limited biological decomposition, and then to examine the biochemical and genetic mechanisms responsible for this decomposition.

In our recent success we were able to demonstrate individual bacterial species that can completely oxidize some of the lower chlorinated biphenyl molecules, virtually all the monochloro species, as well as some of the polybrominated biphenyls, which are very similar in characteristics to the PCBs.

To date we do not have strong evidence that the highly chlorinated compounds are subject to any degradation. From what we can tell, perhaps the dichlorol PCB's are degradeable by these organisms, also.

The interesting part of this work is that up until this point there has really been no conclusive evidence that even the monochlorinated compounds were completely degraded to carbon dioxide and water, which is essentially terminal decomposition of a hazardous material.

The organisms that we isolated can carry out this complete oxidation for at least one of the chlorinated species, and that is four chlorobiphenyl. They can essentially oxidize the material to CO_2 and water in a relatively short period of time, in less than 2 weeks.

Another novel aspect of this work is that the genetic reason for these organism's ability to carry out this degradation is that the particular genes involved in producing the enzymes are located on plasmid DNA.

Plasmid DNA is separate from the normal chromosome of the cell, and recently it has been noted that much of the degradative capacity for fairly exotic, naturally occurring substrates, as well as some other potential environmental pollutants, such as 2-4,D, naphthalene, and these types of materials is located on plasmic DNA.

These plasmids make it possible to actually genetically manipulate bacterial strains, as well as transfer this capability of degradation of one chlorinated biphenyl substrate to different bacterial

strains. We have recently demonstrated that process, that we could transfer this genetic capability to different organisms.

With recent work with scientists at the University of Illinois, in New York, as well as the University of Washington and other places, we may now be on the verge of being able to talk about some genetic engineering that may actually promote the degradation to some of the higher chlorinated compounds. I could give you an example in that recent evidence indicates that pentachlorophenol can be completely dechlorinated by bacterial strains.

If we can identify the genes responsible for this degradation, essentially splice them into DNA for organisms capable of PCB degradation, we may be able to promote some degradation of the higher chlorinated materials. But to date I have to say that the higher chlorinated materials are virtually indestructible in terms of their degradative fate.

Additional work along these lines relates to the ability of the organisms to actually accumulate PCB, which must occur before any degradation can occur. Degradation does not occur externally to the bacterial cells, it occurs internally, and this is true for virtually all the xenobiotic molecules in that the organisms actually have to assimilate or take the material into the cell.

These organisms can actually remove PCB residues from clay particles and sediment particles to which the PCB residues have been bound. So the organisms appear to be very proficient in terms of their biological capacity for degradation of a fairly simple model PCB residue.

In additional work at the university we are involved in a subcontractual piece of work with a local industry to look at the fate of some priority pollutants in a conventional waste treatment system related primarily to an activated sludge system. In this particular piece of basic research we are trying to determine what factors limit biological decomposition in conventional waste treatment systems. The biochemistry of degradation is an extremely complex process. In a complex waste stream you may have literally thousands of chemical substrates that bacteria will degrade.

Many of these chemical substrates promote a sparing action on the hazardous waste material that you want decomposition to occur. As a result, many industrial waste treatment systems that we see now, and some domestic systems, really report the evidence of some removal of an organic contaminant. In reality this removal may not actually be decomposition, it may be volatilization or absorption to bulk sludge or whatever, essentially localizing it in the waste stream.

The particular research sponsored here is to determine what factors actually limit the degradation of some of these priority pollutants in industrial waste treatment systems. Before we can actually talk about applying genetically engineered organisms for biological degradation, we must rethink our concepts in terms of engineering designs for biological waste treatment systems to optimize the utilization of potentially novel organisms in terms of their biodegradative capabilities.

I don't think I will go any further at this point and save any questions for later.

[The prepared statement of Dr. Sayler follows:]

Developments and the Potential for Biological Treatment of Hazardous Wastes

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Report To:

The Committee of Science and Technology
Subcommittee on Investigations and Oversight
United States House of Representatives

May, 4, 1983

Environmental pollutants, potentially hazardous to human health and ecosystem function, are frequently classified as "Xenobiotic" chemicals. Xenobiotics in this context generally are defined as man made (anthropogenic) materials derived from chemical synthesis or natural chemicals released as products or by products from industrial sources in concentrations significantly higher than those produced from natural sources. The general chemical structure and physical properties of xenobiotics of anthropogenic origin makes them "foreign" as compared to natural chemicals in the environment and accounts for their sometimes toxic properties and persistence in the environment. This persistence is a result of chemical stability and their foreign nature which makes them unrecognizable as chemical substances to be broken down (or decomposed) by the activity of microorganisms. The purpose of this report is to describe current research at the University of Tennessee, Knoxville dealing with the microbiological decomposition (biodegradation) of xenobiotics and to discuss the convergence of knowledge on biodegradation with emerging genetic technologies that may enhance the biological destruction of hazardous environmental contaminants.

Research in the Department of Microbiology and the Graduate Program in Ecology

at the University of Tennessee, has focused on the biodegradation of xenobiotics designated as priority pollutants with particular emphasis on polychlorinated biphenyls (PCBs). PCBs are recognized as hazardous environmental pollutants of global distribution and concern. These chlorinated organic molecules were marketed as complex mixtures with wide ranging industrial applications and commercial use. Over their 50 year production and use in the United States approximately five pounds of this material was produced for every man, women and child. While it has been estimated that one-half of the total PCB produced (app. 1.4 billion pounds) is still in service, nearly 500 million pounds have entered the environment and, of that, 300 million pounds is presently in land fills.

PCB are true xenobiotic pollutants with no known counterparts produced in nature. This foreign nature and extreme environmental chemical stability has led to their resistance to biodegradation (biological recalcitrance) and resulting accumulation in the environment. Previous studies on the microbial biodegradation (primarily bacterial) have indicated that highly chlorinated PCBs are impervious to biological attack and that even low chlorinated PCBs are only subject to incomplete biodegradation under laboratory conditions. Our recent research has demonstrated that natural bacteria in uncontaminated reservoir environments are also capable of incomplete biodegradation of the lesser chlorinated PCBs. However, our more recent research has demonstrated that, in PCB contaminated reservoir sediments, bacterial populations exist that carry out the complete biodegradation of the lower chlorinated PCB residues as well as some polybrominated biphenyls (PBB). The results of this study indicate that environmental contamination may exert a selective effect for the development of novel biodegradative capabilities among bacteria exposed to prolonged PCB contamination in natural environments. Essentially, we may be able to view the process of evolution of biodegradative capacities.

Recently, another investigator at the University of Illinois has demonstrated that genetic selection for new degradative capabilities can be produced in laboratory cultures exposed to high levels of PCB stress. This selection termed "molecular breeding" also resulted in bacterial strains capable of biodegradation of the lesser chlorinated PCB. Both our research and that mentioned above indicate that the genetic determinant of these new biodegradative capabilities is found on "plasmid" DNA within the bacterial cell.

Plasmids are pieces of DNA separate from the chromosome of the bacterial cell and are not required by the cell to support life sustaining processes. Since their relatively recent discovery, it has been shown that many exotic functions performed by bacteria are determined by the existence of Plasmid DNA. In addition, plasmids represent a mechanism of genetic exchange between bacterial cells, which are normally asexual, and using recombinant DNA technologies have also been employed to genetically manipulate or modify living cells. Consequently, plasmids involved in the biodegradation of PCB and other environmental contaminants are ideal candidates for enhancing biodegradative abilities among bacteria.

In addition to our isolation of bacteria capable of degrading the lesser chlorinated PCB, we have also demonstrated that sunlight can sensitize PCB molecules with a resultant five fold net increase in that rate at which they are biodegraded. Furthermore, these same bacteria also demonstrate a profound ability to accumulate PCB residue which may be precedent to biodegradation and potentially useful in localizing or concentrating PCB in waste streams or contaminated environments.

In conjunction with EPA and NIH sponsored research on the biodegradative fate of PCB in the environment, cooperative research is being conducted with an industrial primary EPA contractor on a project to predict the fate of priority pollutants in industrial waste treatment processes. In this integrated project, university - industry scientists and engineers are studying the parameters that determine the rates of specific

pollutant removal in activated sludge waste treatment. Industry investigators are determining rates and factors effecting the physical absorption and volatilization (stripping) of pollutants, while we are describing the biological factors determining the rate and extent of bio-degradation of the pollutants. This EPA project has a significant role in developing predictive methods to determine the fate of pollutants in conventional waste treatment. Equally important is the role this project plays in determing the ability of waste treatment engineering designs to efficiently capitalize on the potential development of microorganisms designed for specific applications in biological waste treatment. Specific factors being examined in this study include: determining the selectivity and specificity of biodegradative processes in complex matrices of industrial waste, the concentration of pollutant to which microorganisms are actually exposed when competitive factors such as volatilization effect a waste system, the time required to adapt a biological population to a specific waste and stability of that population over time. Factors such as these are of fundamental importance in determining the potential for biological degradation of pollutants in the environment or waste treatment facilities.

Advances in the biological treatment of hazardous pollutants are expected to develop from two frontiers that are being brought together by efforts of the EPA and other federal agencies, industry, and the academic community. These frontiers are the accurate description of the factors effecting biological degradation of pollutants and determination of the biochemical and genetic mechanisms responsible for the microbiological degradation of xenobiotics.

Potential advances in the area of biological treatment of hazardous pollutants are expected to develop from a more comprehensive understanding of the biochemistry and genetics of biodegradative mechanisms, and environmental factors effecting biodegradation. Application of this knowledge to biological waste treatment systems

for hazardous pollutants will require a greater understanding of the strengths and weaknesses of conventional and novel engineering designs. In this regard a greater level of integration between basic science of biodegradation and engineering systems is required in order to fully develop efficient biological treatment technologies. Recent EPA efforts in this area promises to draw upon university and industry strengths in order to unravel these complex interactions.

During the past decade considerable research evidence has been developed by academic scientists that numerous environmentally persistant pollutants can be partially or completely degraded by microorganisms under defined laboratory conditions. The challenge has been to determine what factors limit biodegradation in the environment which result in the observed persistence of the pollutant. Many physical-chemical factors, such as binding to soil particles or lack of available oxygen, as well as biological factors, like biochemical repression on inhibition by other organic molecules and competition among microorganisms for available nutrients, have been identified as factors limiting biodegradation. With the more recent discovery that genetically distinct determinants (plasmids) may respond to and mediate the biodegradation of xenobiotic contaminants, such as PCB and 2-4 D (2-4 dichlorophenoxy acetic acid, herbicide), it is possible to suggest that the reported partial metabolism of the parent dioxin molecule may evolve through plasmid mediated mechanisms or that this basic metabolism can be subjected to genetic manipulation.

A greater emphasis is needed on basic research into the occurrence of novel biodegradative microorganisms, their biochemistry and genetics. Relatively few microorganisms have been studied in sufficient detail to fully exploit their utility in biological waste treatment. No one or two bacterial species can be developed to degrade all classes of xenobiotics. In addition relatively few xenobiotics have been comprehensively examined to determine if possible biodegradative strategies exist, or

can be developed or enhanced. This emphasis should include both focusing ideas and resources on conventional and novel biodegradative processes and integration into an efficient waste treatment design.

In summary, persistent xenobiotic molecules may be biologically degraded under, select or defined, laboratory or environmental conditions. For some xenobiotic, such as PCB, this biodegradative capability may have recently arisen as an evolutionary response to prolonged bacterial exposure to the xenobiotic. For a few well defined (biochemically and genetically) microorganisms it is possible to alter or enhance biodegradative capabilities. Rapid advances in biodegradation research can be attained with new genetic information providing insights into the biochemical and environmental aspects of biodegradation. To fully exploit these advances a continued effort must be sustained to integrate scientific and engineering knowledge in developing biological waste treatment technologies.

Mr. GORE. We will have a lot of questions. That was a fascinating statement.

We are going to have to have a brief recess for a vote on the floor. When we come back, Mr. Kucera, we will hear from you. If you will be patient for a moment, we will reconvene in about ten minutes.

[Recess.]

Mr. GORE. The subcommittee will come back to order.

We will hear now from Mr. Ron Kucera, deputy director of the Missouri Department of Natural Resources in Jefferson City, Mo. Welcome.

Mr. KUCERA. Thank you.

Mr. Chairman, members of the committee, I would like to extend my thanks to the committee for the opportunity to appear here today to discuss the subject of alternatives to the landfilling of hazardous waste.

I serve as deputy director for the Missouri Department of Natural Resources. Our department has responsibility for parks management, historic preservation, geologic resources, energy and environmental quality. Without a doubt the most difficult issue facing our agency has been the management of hazardous waste, including wastes currently generated, as well as those which did not receive proper or adequate disposal in the past.

I am proud to say that it is the policy of the State of Missouri, enunciated in statute, to discourage the landfilling of hazardous waste. In 1980 the Missouri General Assembly passed amendments to the State's hazardous waste law enacting more stringent standards for the permitting of landfills, placing a tax on the generation of hazardous waste, and requiring the use of practical alternatives to landfilling.

The injection or landfilling of bulk liquid hazardous waste is entirely prohibited. Missouri is a leader among the States in reducing the dependence on landfilling for the management of hazardous wastes. Currently in Missouri less than 5 percent of the wastes generated in Missouri are destined for disposal by landfilling, and that compares with substantially larger percentages in some other states.

We are now vigorously pursuing further amendments to our waste law which will place a very substantial tonnage tax on all hazardous waste that is disposed of through landfilling We are confident that this new law will provide strong additional incentives to Missouri industries to invest in process changes, recycling, treatment and incineration. The revenues from this new tax will be targeted to the correction of problems caused by poor waste management practices of the past.

As the members of this committee are most certainly aware, the public policy concerns over the use of landfills are not restricted to the matter of current and future waste generation. The cleanup of old, inadequate or leaking waste sites often yields large volumes of waste that must be managed by legally approved hazardous waste facilities.

If, as is frequently the case, large quantities of contaminated soil are involved, landfilling usually is thought to be the least-cost option when compared to treatment or incineration. Though we do not yet have good cost estimates, this relationship appears to hold for the remedial action alternatives that we have so far seen and have been discussing.

I would like to take just a minute to acquaint the committee with the numbing reality of the dioxin problem that we are facing in Missouri. It is a dilemma of almost unfathomable proportions, and there is no tonic cure, no easy solution.

As of this week our department's investigators, working cooperatively with the staff of the Kansas City regional EPA office, had confirmed through quality-assured sampling and analysis the existence of 30 separate dioxin sites in Missouri. Our investigators continue to find additional leads, and if the current trends persist, we will no doubt confirm more contaminated sites.

It is estimated that the total volume of contaminated soil with greater than one part per billion 2,3,7,8 tetrachlorodibenzo-p-dioxin could exceed 400,000 cubic yards or 500,000 tons.

The frequently suggested solution of high temperature incineration could easily cost more than $2,000 per ton. I think those are figures that CH2M Hill probably would agree with. Simple multiplication reveals that if we want to go with incineration, the costs in Missouri to solve the known dioxin sites would be over $1 billion.

Another alternative which we have been looking at is solvent extraction, where you take the contaminated soil and remove the dioxin using solvents and then run the solvent into an incinerator. That methodology probably also costs more than $2,000 a ton.

Similarly, if you use the solvent extraction method and then try to use photolytic destruction of the dioxin, as we did in southwest Missouri for a relatively small area, where the waste was in con-

taminated oil, the costs are still over $2,000 a ton. So, with those approaches we are looking at costs of over $1 billion.

Futhermore, investigations may reveal similar though perhaps smaller dioxin problems in Arkansas, California, Illinois, Kansas, Michigan, New Jersey, New York, Ohio, Oregon, and Pennsylvania. These were all States that had a parallel situation to us in Missouri, where 2,4,5 T and 2,4,5 TCP were used heavily.

It is my very firm belief that if the environmental control programs in these other States begin looking at the waste disposal practices of these industries that worked in their States and they investigate with the same fine-toothed comb that we are now using, they are going to find similar situations to what we are facing in Missouri, though hopefully they will not have the same magnitude of the problem we have. But, I think they are going to find it in those other States.

The thrust of all this is that we are into a situation where we are exceeding the capability of the Federal Superfund. I think that what we have to do is make sure that we are really looking hard at all of the options.

We certainly want to avoid landfilling, if that is at all possible, but it is very frustrating to note that it seems like as we have been looking at the technologies for solving our Missouri situation, what we found is that there are so many questions with the various technologies that we have got to get on with more research, very intensive research on possible solutions to the dioxin problem.

If we have to decide between the less costly options of landfilling or some sort of solution where you leave the dioxin in place but then try and foster natural degradation of the dioxins through, perhaps, partial treatment, then it is abundantly clear that we need to know more about the fate of dioxin in soil as a function of time.

We invited some of the best dioxin researchers to meet with our very distinguished dioxin panel that we had put together in Missouri. What we found was that there were widespread opinions that varied on exactly what happens in soil. The experts did not necessarily agree.

For us, as an agency, trying to decide what we should be doing, it makes it very difficult to gamble on a solution line in-place stabilization, when you really don't have a good handle on exactly what happens to the dioxin.

A major question is, Does the dioxin have a half-life that is going to eventually yield a solution through the mere progress of natural degradation in the soil? I wish we knew the answer to that. That is the most important question when we are dealing with a situation that is so costly and is creating so much public health concern.

Yet, the experts really did not give us a good answer to that. The CDC still says that the half-life of dioxin in soil is somewhere between 1 year and 12 years. I really wish we had a better handle on it.

Unfortunately, we have found that there are crucial information deficiencies. The basic research that would allow us to make confident predictions about the behavior and half-life of dioxin in Missouri soils has not yet been initiated.

Fundamental questions about the naturally occurring reduction of dioxin concentrations in soil through photolysis, biotic activity,

volatilization, and solution have not been answered with adequate precision. Amazingly, after all the years of debate we do not yet have a good handle on the half-life of dioxin in soil, nor do we know which degradation process predominates.

Some researchers have identified the apparent disappearance of dioxin on a test plot. They don't know how it left the test plot. If it left it by solution and was merely transporting the problem to somewhere else, then that probably is not the solution that we want to rest on.

If biological activity near the surface was allowing for the soil to be overturned frequently enough that photolysis was destroying the dioxin, then perhaps there is some promise there with land treatment that would routinely allow the soil to be overturned.

If volatilization allows over time the dioxin to get into the air and combine with elements in the atmosphere and then eventually be photolytically degraded, then that perhaps is a promising solution. We would need to make sure that if we had on-site stabilization, that we did not interfere with the volatilization of the dioxin. If you put even a small cap over it, you may prevent that.

There are too many questions at this point, but hopefully, through research, we may learn that there are effective methods for enhancing and accelerating natural dioxin degradation in on-site applications.

It should be noted that natural degradation processes might be severely reduced in the environment of a landfill, where photolytic degradation and volatilization and biological activity would be substantially reduced, or reduced to zero, and you would be left with a lengthy persistence of dioxin.

It is vital to our efforts in Missouri that the research and development program within EPA provide accelerated funding to dioxin-related research activities. This is definitely not the appropriate time to diminish the EPA budgetary commitment to research. We note that that is a current proposal before the Congress, to reduce the total amount in the R&D budget for EPA.

We believe firmly that we cannot afford to base multi-million dollar remedial action decisions on nickel research. That is about where we are right now with our level of understanding of what happens to dioxin in soil.

There is one other point I would like to make. As far as our difficult situation in Missouri is concerned, it is very obvious that we are going to need an extension of Superfund. From what I hear, the priority list that was put together, which we have all seen, is not going to be fully addressed by the existing Superfund. In fact, EPA probably will not get even halfway through the list of 400. I have heard 160 with the existing Superfund. That leaves Missouri and many of these other States that have potential dioxin problems out in the cold if we do not have an extension to Superfund.

I wanted to leave with this committee two requests: That you help us out on EPA R&D attention to dioxin; and that when the time comes in this Congress, that we all work together for an extension of Superfund.

Thank you.

Mr. GORE. Thank you very much. I will have a few brief questions, and then I will turn to my colleagues.

This is really a nuts and bolts hearing about how to move to alternative disposal techniques. What we have found in our investigation is that there are two sets of problems: economic problems and scientific problems.

There are currently economic incentives that encourage the irresponsible disposal of hazardous waste because our current system does not account for the long-term costs of landfill disposal.

As a result of that failure, the landfill disposal techniques currently appear to be the cheapest disposal techniques when actually they are the most expensive disposal techniques, when one takes into account the long-term costs in the form of health and environmental damage and the cost of subsequent cleanup.

So, we are going to recommend some changes in the economic structure that accounts for those long-term costs. Mrs. Schneider is one who has taken the lead in that regard. I have introduced legislation, as well, which is quite similar, but the scientific problems must also be addressed.

What we are really about in this 2-day hearing is to look at how readily available the alternative technologies are. We heard from OTA and from the National Academy of Sciences, and now we are going to hear from some of those who have really been doing the nuts and bolts work.

The most promising alternatives, of course, are reduction at the source and recycling. When you get to the actual alternative disposal techniques, you have high temperature incineration, chemical treatment, and biological treatment.

Dr. Sayler, you have been a pioneer in the field of biological treatment. I want to ask you a few brief questions about it.

You said in your testimony that you have been able to isolate organisms that are capable of degrading or breaking down some of the substances in the PCB family that have been thought in the past to be indestructible.

I got two things out of your testimony that I wanted to ask you to explain a little bit further.

First of all, the genetic information which makes this degradation possible you said was found on a DNA plasmid. I take it that the significance of that is that that means that genetic information is in a form which is readily transferable to other microorganisms and other microorganisms can thereby be imbued with this same ability to degrade some forms of PCB's. Is that correct?

Mr. SAYLER. That is correct; yes.

Mr. GORE. Second, only some forms of PCB's are subject to this kind of treatment, right?

Mr. SAYLER. That is right.

Mr. GORE. The simpler forms of PCB?

Mr. SAYLER. That is right.

Mr. GORE. Now help me with this. We have this tremendous problem with hundreds of millions of pounds of PCB's in the country. What percentage of the PCB problem lies within the simpler forms that are currently susceptible to these organisms that you have isolated?

Mr. SAYLER. Probably a fairly small percentage of the total PCB problem. Some of the lower chlorinated materials that our organisms degrade have been implicated as mutagens or comutagenic

agents. The more toxic materials are the higher chlorinated materials.

PCB's inherently do not demonstrate that acute toxicity. I think it is their long-term potential mutagen/cocarcinogen hazard that may be more significant than their acute toxicity.

Mr. GORE. Although there is disagreement about teratogenesis and carcinogenesis, is there not?

Mr. SAYLER. That is true.

Mr. GORE. There is some strong evidence on liver cancer, if I am not mistaken.

Mr. SAYLER. That is true; yes.

Mr. GORE. Even though the organisms you currently isolated are effective only against the simpler forms of PCB's, you have reason to believe, because of the accessibility of the genetic information which is relevant, you have reason for optimism that you can genetically engineer microorganisms which will be effective against more complex forms of PCB?

Mr. SAYLER. That is right. I think there is some potential there. The organisms essentially contain a complete biochemical pathway for the destruction of these low chlorinated PCB molecules, so basically what we need to include now in terms of genetic information in these cells is to get some genes into those cells that would allow them to perhaps dechlorinate the higher chlorinated materials, and then promote the oxidation. The rest of the biochemical machinery is there. The organisms can do it. So I think we are talking about potential strategies in focusing on certain areas.

Dehalogenation reactions of various types become critically important in terms of degradation of many of these hazardous materials. Fortunately, there has been some focus toward that area of research, in trying to clearly define if genes exist that do promote enzymatic dehalogenation, can they be transferred to other organisms, can you manipulate their levels in the cell in terms of the levels of enzymes that are produced.

So, there is work occurring in that area, but I think we really need a greater focus on that particular issue, the actual genetic and biochemical mechanisms involved.

Mr. GORE. It is safe to say, is it not, that your technique has implications for the longer term?

Mr. SAYLER. That is true.

Mr. GORE. Of course, the term involved is eternity if you don't figure out how to break them down, because they are not going to break down otherwise, so we need to focus on the work that is being done at the University of Tennessee for a long-term solution to some of these substances that will not break down otherwise.

For the more immediate short term and mid term, we need to pay careful attention to the economic incentives and the structure of our laws. You pointed to that as well, Dr. Sayler. We need to look closely at other biological treatments, chemical treatments, high temperature incineration, and these other alternatives.

I recognize Congresswoman Schneider.

Mrs. SCHNEIDER. Thank you very much, Mr. Chairman. That sort of leads into a question I have of Mr. Wallace.

Mr. Wallace, you mentioned some different techniques, such as ultraviolate light treatment, molten salt combustion, and some

others. I was wondering how practical are these particular processes?

Mr. WALLACE. Many of the processes are very practical today. The problem is what you are feeding the process that is going to be destroyed. I think there has been some good demonstration that molten salt processes work on certain chemicals. Certain other high-temperature incineration processes are out there, and there are a number of them that have proven out in the laboratory that worked very well.

Mrs. SCHNEIDER. But how many of those have moved from the laboratory into actual application?

Mr. WALLACE. That is the burning issue. What is happening is that for a specific problem—for instance, looking at dioxin-contaminated soils—the media that you have to get that material into before it can be processed, it may have to go through some complicated steps.

For instance, in looking at contamination of soils where dioxin or PCB's would apply, you are talking soil mixtures. They are not pure substances, they are trees and roots and rocks, as well as a number of other things that are part of the contamination.

In order to get that to a point where it will mix well with the process you are dealing with, you have to go through a number of grinding steps. You turn the processing into a miniature mining operation just to bring the contaminated soil to a point that it can be processed within the confines of that particular process.

In fact, some of these processes look pretty promising. They are the easy step. It is all of the ancillary processes that go along with it that make the whole implementation very difficult.

Mrs. SCHNEIDER. As you are speaking I can't help but see dollar signs flashing before my eyes. I wonder if you could address the cost of some of these procedures.

Mr. WALLACE. Mr. Kucera indicated that he looked at some dioxin costs and they were in the $2,000 per ton variety, which is quite high. I am not sure on specific cases I can address costs, but generally they are going to be much, much higher than landfilling, as pointed out by the chairman and others, and may be a factor of 10 or 20 or more. It simply depends on the specific case.

We tried to point out in the testimony the kinds of magnitudes you are dealing with in size in really designing for a small amount of waste a medium-sized chemical plant, which may take up 20 acres, and the cost of that is in the $10 million to $20 million variety for cleaning up certain sites in this country.

Mrs. SCHNEIDER. Thank you.

Dr. Sayler, what advantages does the biological approach to hazardous waste have over some of these other technologies?

Mr. SAYLER. There may be a disadvantage initially because there is a lot more basic research that is needed to be done. I think in the long run there could be cost-effective alternatives.

I think in some cases it might not be much more expensive to deal with certain priority pollutants using something similar to conventional waste treatment or some of the more advanced industrial waste treatment systems, you have to have the organisms first before you can initiate some type of waste treatment process.

Mrs. SCHNEIDER. Where does your research go from here, hoping that it moves beyond the University of Tennessee to national application and expansion. What are your plans?

Mr. SAYLER. I don't know necessarily that we will try to make a development step in our work. I think it is possible that it could be picked up by other people that are more involved in development along these lines.

There is a chance that something could be done with some of the organisms that we have already isolated. There could be some possible developments.

Mrs. SCHNEIDER. I see. The staff person mentioned that you would be moving to Rhode Island to expand it nationwide, so that is one step in the right direction.

Mr. Kucera, I wanted to mention to you that I also serve on a subcommittee that deals with the budget for EPA's research. Just yesterday we added $78 million to the research budget, so I think that that, too, will move through full committee. I think you can breathe a little more easily. We were very concerned about the figures that the administration had proposed to us, and we decided to substitute it with some other proposals.

Mr. KUCERA. That is wonderful, and now if we can make sure some of it is targeted to the dioxin research.

Mrs. SCHNEIDER. That was my next point. I think you have some interested ears certainly on this committee, and certainly from Missouri. I am sure we will see something of that sort. Also, there are plans for the extension of the Superfund, which I should mention to you; that there were moneys included in many of the toxic areas of research and development; and also moneys for alternative technologies. So I think we are moving in the right direction at long last.

Those are all the questions that I have at this time. Thank you, Mr. Chairman.

Mr. GORE. Thank you.

Congressman Reid?

Mr. REID. Would you explain to me, first of all, why you did the research?

Mr. SAYLER. We are using chlorinated biphenyls as a model for other environmental contaminants. We have a tremendous amount of past experience in terms of biological effects of the chlorinated biphenyls on microorganisms. The research really is trying to delineate those particular factors that may control for the eventual development of some degradative strategies on the parts of microorganisms.

The PCB's in this sense are essentialy model groups of environmental contaminants, models for other types of contaminants with similar physical chemical characteristics as PCB's.

Mr. REID. Do you feel that your research has further to go?

Mr. SAYLER. Very definitely, yes.

Mr. REID. You feel that with this process that you have elaborated there could be more done to the more toxic PCB's?

Mr. SAYLER. I think there is some potential in that area. We are also very interested in looking at the synergistic effects of things such as sunlight on the degradation of the chlorinated biphenyls.

Mr. REID. On the what?

Mr. SAYLER. The synergistic effects or the additive effects of a photochemical degradation or or sensitization of PCB's, especially once they have been accumulated by the bacterial cells.

We are not certain whether the PCB's can be photochemically activated or not, but if they can, we could envision some of the higher chlorinated materials being photochemically sensitized on the surface or in the bacterial cell and then followed by some biochemical or biological mechanism of degradation.

Mr. REID. What are the limitations on your research now? Is it a money thing? Is it a facility thing? Is it a time factor? Why can't you go further?

Mr. SAYLER. It is just a slow process. I hate to say this, but we are relatively well-funded for our particular research that we are doing. The degradation process is limited to just a very few groups of organisms in the contaminated systems that we have been working with.

The matter of isolating particular genes from microorganisms is a time-consuming process. You have to approach these things in a step-wise fashion. We try to do our work in the best scientific, credible fashion we can so everything is completely controlled and clearly identified. We try to come up with unambiguous, concrete results that can be clearly defended and useful in their final outcome. So, it is a rather slow process.

Mr. REID. Mr. Wallace, what is your opinion of the biological processes described by Dr. Sayler?

Mr. WALLACE. I think I agree with Dr. Sayler in the fact that they are very, very promising technologies. Our company, CH2M Hill, has done a lot of work in the biological field, earlier work, dealing with wastewater treatment and found a lot of success there.

It seems to be a reasonable analogy to say that this further work is simply an advancement of that technology and can go forward and shall take time to research but probably will be able to be utilized sometime in the future.

Mr. REID. If I could ask each of you, if you have an opinion—if you don't, don't respond—on what additional areas of research are needed as to help this problem, which is in every periodical you pick up, just about?

Mr. WALLACE. Research is important, and the areas of research that are identified by each technology, each technologist looking at his own area and saying I can see some promise here, I think that needs to be scrutinized and looked at and certainly funded, but not to simply throw dollars at that problem. I think there has to be some engineering development that goes along with that. The applications seem to be for us in our perspective the limiting problem right now.

Where each technology has its advantages and disadvantages, those advantages to us in the application would be best addressed by trying to come up with engineering and design data so that you can move it from the research and development laboratory scale, on up through a pilot scale, on up to final implementation.

The development of good, sound engineering data is what I believe to be one of the key elements to a sound engineering approach to this problem.

Mr. SAYLER. I tend to agree with those comments, not even being an engineer. I work with a lot of engineers, and there is a tendency to not interface well. We are talking about some biological alternatives to hazardous waste management that do require specific engineering process designs for utilizing organisms that are developed.

Frequently there is a lot of miscommunication and problems that occur at the engineering level between the basic sciences and the engineers. There is going to need to be a greater integration of efforts between these two groups.

In terms of the basic science, I think the limitation is that there is a tremendous host of contaminating molecules out there in the environment and relatively few of them have really been examined in good detail.

We have some information, very solid information, on perhaps two dozen potentially hazardous pollutants. By this I mean a lot of data, clear data from the standpoint of the mechanisms of biodegradation, as well as the genetics in the system.

That is really limited in terms of a tremendous number of molecules that are out there. So I think we need to focus on this issue a bit in terms of the degradative strategy of organisms, in terms of finding organisms that have those capabilities, examining the possibility for manipulating those capabilities, and really determining how the genetics and biochemistry control the situation.

This summer, NSF and EPA are sponsoring a symposium on the genetic potential for pollution control at the University of Washington in late July. That symposium will focus on some of these particular issues in terms of what are the needs right now, where are we and where are we going in terms of this area.

This area is really in its infancy in terms of genetic engineering of microorganisms. We are a long way away from what has been done in the biomedical area of being able to perhaps produce insulin and things like that. We are a long way from that.

We are still in an infant stage, but the molecular genetics is basically dragging the environmental and biochemical ends of the field along with it. Some rapid gains can be made there using genetic tools to clearly define what organisms can and cannot do and what we can and cannot do in terms of being able to change their biochemical capacities.

Mr. KUCERA. I would like to respond to that, too. I would just have a very simple comment. I think we can't forget about the low tech solutions, too. There tends to be a lot of glitter and glamour with the high tech engineering solutions that might not have ever been used yet, although we certainly want to look at all of those options.

But we cannot forget about the solutions that we may have to look at. I think that there has to be a lot better understanding of how dioxin operates in soil, and I think that is a major deficiency in understanding right now. That is one place that I would like to see a lot of research.

Mr. REID. Thank you, Mr. Chairman.

Mr. GORE. Congressman McCandless?

Mr. MCCANDLESS. Thank you, Mr. Chairman.

I would like to direct my questions to the panel as a whole and if there is a specific desire to answer, certainly that is the intent of our being here.

I listened very carefully to your testimony. Congressman Brown and I had an activity a couple of weeks ago that had to do with the Stringfellow problem out in California. We heard quite a bit of testimony on that from those areas.

In all of this, there seems to be an absence of any discussion on what might be happening in the highly industrial, high density population areas of Europe and Asia, where the day-to-day technology that creates what we have in the way of toxic waste exists.

Do we have here something where we are trying to invent a wheel in the United States and that wheel already possibly has some spokes on it in another country? Are we coordinating as a scientific panel—I use that in a general sense—activities here in a highly important area brought about by the industrial complex that we enjoy here, as they do in Japan and other high industry countries?

Mr. SAYLER. If I could answer first, in the area of biological degradation some of the truly advancing work is occurring in both Great Britain and Germany. Some of the best work in terms of genetically manipulating organisms and creating new biodegradative capacities is occurring there, but it is being well-integrated with the science in this country.

The work that is being done in Japan—and Japan has very severe problems, as we all know—is available to almost all the people in the United States working on similar problems. I have an individual scientist from the Japanese Institute of Environmental Studies, the equivalent of our EPA, working in my laboratory on a visiting professorship. So the information that the other countries are developing is being shared.

I would say in terms of our regulatory functions, we are ahead of many of the other countries. We are not necessarily ahead in terms of the actual research, but we are all pretty much on somewhat of an even keel right at the moment.

Mr. WALLACE. Let me answer, also. First, as far as exchanging data goes, we have looked at dioxin problems across the world in order to figure out what the best solution might be. One of the places that unfortunately has become a model to look at is the Sarvecio, Italy, problem where they have had to deal with dioxin-contaminated soils for quite some time. The research we have done has relied heavily on that data in looking at possible solutions and seeing how things happen in a real problem situation.

Also, I would mention that the European countries are moving along to solve some waste problems. There are some good examples out there today. There are some others, and I think it is safe to say that they also have their share of problems.

Notably, as far as good solutions go, the group out of Denmark has proposed and has utilized a system where they have managed their wastes from cradle to grave, if you will, from a central point for quite some time and have a number of processes developed.

I think it represents a very good model solution. I am not sure if we can implement that kind of full management scheme in this country, but they have chosen to manage all kinds of wastes at all

levels through a central point, through collection systems and into treatment processes. In talking with some of their officials, we have noticed that they have adapted this in other countries, including West Germany and Finland.

Mr. KUCERA. I would comment that our experience in Missouri with firms that are trying to comply with the current regulations are that if there is inadequate incentive for the company, whether it is their fear of liability or a big tonnage tax, like our legislature is considering now, the technology will transfer easily.

If the incentive is there, if the company decides that they want to employ the latest technology, there is no problem with the transfer. Whether it is coming from Japan or Germany, it will be employed in Missouri or other States, too.

Mr. MCCANDLESS. Let me develop a quick scenario for a quick response.

In its infinite wisdom either the States of Missouri or California or the U.S. Congress all of a sudden comes up one day, and they say that anyone who manufactures something that results in a waste that is considered to be class one or toxic, or whatever the definition is, must treat that waste and render it harmless to society, before it can move from the site where it was created to some other location.

If that theoretical law were implemented tomorrow, how capable are we as a society of being able to technically address that? Have we reached that point yet?

Mr. KUCERA. In Missouri there would be some practical problems with the middle and smaller sized firms that would simply not be able economically to do that. Some of the larger firms in Missouri, like Malinkrodt, Monsanto and American Cyanamid, have the wherewithal to have very good waste management systems set up. I think the waste materials do have to be allowed to move.

Mr. MCCANDLESS. But the technology is there?

Mr. KUCERA. I think it is.

Mr. WALLACE. I think it is there in a sense that you may not render something harmless by treating it, but if you held it in some storage or maybe, despite the subject of this hearing, held it in some sort of disposal mode, it is all technically possible.

The problems that occur are in immediately generating that capacity to manage it in a competent way. I don't think by the day after tomorrow, for instance, that wastes under this control would have to be sent somewhere to a disposal, that could be handled or that the capacity that is there would immediately be used up in a short period of time and cause other problems.

Technology of some sort I believe is there to manage all of these wastes. As far as rendering them harmless by treatment, I don't think that capacity is with us today. I think it could be in the future, but there are certain elemental compounds that simply cannot be treated.

I think we are always going to have some sort of disposal with us to manage these wastes in one way or another, albeit that might be very small.

Mr. SAYLER. I would agree with those last few comments and say that also there would be no way to determine what is and what isn't hazardous or harmless in that we still don't have a sufficient

handle on environmental and possible ecological effects and I don't think there is a sufficient amount of toxicological data to even determine whether some wastes do or do not have long- and short-term human health effects.

So, I think we would have some problems even if we were able to biologically treat the material. There is always going be some left over residual. The products are not going to be converted into nothingness. Those left over byproducts, even after biological treatment, frequently have some residual health and environmental effects.

Mr. McCandless. Thank you, panel.

Thank you, Mr. Chairman.

Mr. Gore. The gentleman from Missouri, Mr. Volkmer.

Mr. Volkmer. Thank you, Mr. Chairman. I have several questions.

Mr. Wallace, I have examined your statement and your possible different alternatives for processing dioxin. When we are talking about dioxin, we will talk about the only one that I think we have in Missouri, which among many dioxins is one that is the most severe.

In relating these, what technologies has your firm actually utilized in disposing dioxin-contaminated material, other than landfill?

Mr. Wallace. First, as a precursor to my answer, I would like to say that we, as a firm, are a consulting engineering firm. We do not directly dispose of waste, but we are an architectural-engineering firm with designed treatment processes, et cetera.

In those terms, we have designed or recommended or somehow dealt with chemical, physical, and biological treatment systems for a long period of time. Originally, it was involved in wastewater treatment, and we have dealt with ways to use sedimentation, collect the waste to somehow manipulate it to a better form that can be better handled.

We have used extensively biological treatment. We have used higher order technologies, such as reverse osmosis, principally to purify water. We have a number of projects involved with purification of water for use in processes in actually developing drinking water from a waste treatment system, using wastewater treatment as an input.

Mr. Volkmer. Again, I get back to my question. Undoubtedly, you haven't because you are a consulting firm, basically?

Mr. Wallace. We design. We don't——

Mr. Volkmer. You are not basically a waste management firm?

Mr. Wallace. No, we are not.

Mr. Volkmer. That is what I wanted to get to.

Do you know of any waste management firms that have in the past treated, like we have in Missouri, as Mr. Kucera pointed out, say, half a million tons of dioxin-contaminated dirt?

Mr. Wallace. I know of no treatment firm that has dealt with that kind of waste.

Mr. Volkmer. Either through incineration or extraction or anything?

Mr. Wallace. No.

Mr. VOLKMER. Mr. Kucera has testified that the estimated cost in Missouri is $2,000 per ton for treatment. Do you have any disagreement with that?

Mr. WALLACE. I have not been involved in that project. CH2M Hill is the consulting engineering firm working for EPA on that particular project in Missouri. My work particularly doesn't involve that particular project, but as far as I know, the number is correct.

Mr. KUCERA. The source of the number was CH2M Hill.

Mr. WALLACE. I simply don't have direct knowledge of that.

Mr. VOLKMER. I think this shows the seriousness, not only in Missouri but I think in other States as well. When we look at the total amount that we have in the Superfund, then we look at the total amount of the cost if we are to do it properly, we are going to have a lot more money or else, as Mr. Kucera has pointed out, have more research in order to find possible other ways of handling it. Do you agree on that?

Mr. WALLACE. Yes, I do. Let me point out, though, that it shouldn't be a deterrent to alternative technologies to look at the Missouri problem and say they are going to be expensive; they may be costly and they may have some risk associated with it.

If the dioxin waste, when they were at the point of the generator, were handled correctly, and they could be handled as a contaminant with an off-spec batch of 2,4,5 T or wherever they would generate it, that could be incinerated. That alternative technology exists and could be done today.

The problem was that that they used a form of land disposal which was oiling the roads or moving contaminated dirt to other spots. That has caused the problem. We are now looking at these technologies which turn out to be difficult to apply in these cases, which I try to point out in my testimony.

That makes it very difficult to apply them and makes it a technical challenge, clearly. Alternative technologies, when one gets the waste in the right form, hopefully at the point it is generated, they can be applied correctly and will be quite a benefit.

Mr. VOLKMER. Whether we talk about PCB's or we talk about dioxin or similar waste from chemicals, some are good and some are bad. Some could be utilized somewhere in our economic system but some, like dioxin, cannot.

When those are placed in the ground in a landfill, do you consider that a permanent disposal?

Mr. WALLACE. As far as a disposal option—and again, you have to look at these case by case and the situations—disposal is permanent only in the extent if it is monitored forever, too. That is a social issue of having managers around that are going to watch whatever comes out of that site and how the landfill or the disposal site is managed. It does not have the same permanency as destroying the material and rendering the residue nonhazardous. From the standpoint, I agree.

Mr. VOLKMER. What alternatives do we have in the State right now, then?

Mr. KUCERA. As far as the dioxin in the soil, I think we are going to have to consider these high tech solutions. At the same time, if we find that there are natural processes that can be enhanced by

our intervention that will allow for achieving a half-life of dioxin in soil that was 12 years—people have thrown that figure around a bit—if we could be sure of that; if we knew that the dioxin really degraded in 12 years in a near-surface environment, which is the way the dioxin is deposited in most of these sites that have been sprayed, if we knew that, then the solution would involve insuring that people are not exposed to that dioxin and keeping them off of it, fencing it, then some sort of land treatment to perhaps enhance this rate of degradation.

It is a very simple solution compared to some of the other, more expensive ones. I think we just don't know enough about that yet.

Mr. VOLKMER. In other words, we are really not at the point where we are going to be able to decide what to do with Times Beach and areas like that, or Shenandoah Stables?

Mr. KUCERA. First of all, we have no place to take the materials. The landfill that is in your district simply doesn't even have the capacity to receive that much waste. I think that waste is going to remain there for some time.

Mr. VOLKMER. Times Beach is under water again, I guess right now.

Mr. KUCERA. That is right.

Mr. VOLKMER. Dioxin is not water soluble, is it? It adheres pretty tightly to the soil. My question is, How much movement can we anticipate?

Mr. KUCERA. It is soluble. The solubility is very low. This is another one of the major questions that we have got in Missouri; Does this very small solubility allow for dioxin to move into aquatic systems and be biomagnified?

Does that, for instance, explain why we have fish in the Spring River in Missouri, near the Verona plant, that have concentrations of dioxin that are from 25 to 50 parts per trillion when we don't see any apparent mechanism for the dioxin to be moving from the Verona plant into the river?

Is it possible that it is in solution in the water in amounts that are so small that we cannot measure it in the water, but then it gets into aquatic systems and biomagnifies up to where we can measure it?

That is something that we don't have an answer to. It is very basic to deciding what the strategy would be for solving the problem, both in the Spring River and at Times Beach, for instance.

We know on the Merrimac River there are aquatic organisms that are contaminated with dioxin, near Times Beach. Did the dioxin get there by having some of the soil particles that were contaminated with dioxin actually physically eroded into the river or is there some very suble transfer of dioxin in its low solubility in groundwater moving into the river?

We talked to a lot of people about that. We get views on different sides. Before we decide what kind of strategy we would use for Times Beach, I think we need an answer to that question, too. It is just one of these things that is so frustration, it is the $64,000 question, or perhaps the $1 billion question. We don't have the answer.

Mr. VOLKMER. This is why you are calling for more research of dioxin?

Mr. KUCERA. I think the research needs to be accelerated, to answer those kinds of questions.

Mr. VOLKMER. I would appreciate it if you would give us a list of those types of things that you think should be researched into, as a result of your experience in Missouri.

Mr. KUCERA. I would be happy to.

Mr. VOLKMER. Thank you, Mr. Chairman.

Mr. GORE. We will look forward to receiving that.

Let me ask you one brief question. Mr. Wallace, let's say that we wanted to burn PCB's and dioxin, high temperature incineration, the best incineration techniques available. You still have a problem with the residue left over. Is that right?

Mr. WALLACE. That is correct.

Mr. GORE. What percentage of PCB's and dioxin could be burned? In other words, what percentage is left over as residue if you take that approach?

Mr. WALLACE. I am not sure of the exact numbers. It is a very, very small percentage. Again, there is a precursor stipulation you have to make; that is, that you are dealing with pure liquids.

If you are dealing with soils, where it is contaminated, and you are burning soil, where that is the waste that you are dealing with that is contaminated with PCB's or dioxin, then the reductions aren't very good and you are ending up with an 80 percent of original weight residue, which is quite significant.

Mr. GORE. There wouldn't be much sense in doing that, would it?

Mr. WALLACE. If the residue was totally nonhazardous, that would make sense.

Mr. GORE. But it is not.

Mr. WALLACE. No, it is not. Dr. Sayler points up we are not sure what that level of safety is. If it reduces it to below some one part per billion level that was used in the target numbers that we are dealing with today as a contaminant level below which is OK and everybody agreed to that, that would be fine.

Unfortunately, while that is a target level, there is a dispute as to what the real, no effect level might be in leaving you with material that you could dispose of as solid waste or as just plain soil.

Mr. VOLKMER. Mr. Chairman, could I interrupt on that for just a moment?

Mr. GORE. Yes.

Mr. VOLKMER. In other words, if you had a large sample of soil that had a contaminant of 20 parts per billion and you are going to incinerate the soil in place, not use a solvent or extraction, then to that incineration you still end up with 80 percent?

Mr. WALLACE. I believe those numbers are correct. I would have to check that.

Mr. VOLKMER. It would be around 16 parts per billion?

Mr. WALLACE. No, no. What I am saying is that the quantity, the weight of material going in versus the weight going out, the ratio is 1 to 0.8; in other words, 80 percent of the weight is reduced. If you are burning in soil, you have a combination of organics that burn and inorganics, and that in the treatment temperatures we are looking at for this kind of an incineration there is a reduction.

Mr. VOLKMER. What would be the possible reduction in the contaminant itself, the dioxin?

Mr. WALLACE. What we are trying to accomplish, at least in the engineering so far, what we looked at as treatment processes, we are looking at rendering the soil that is heated to a dioxin contaminant level of at or below one part per billion in this case.

Mr. VOLKMER. Thank you, Mr. Chairman.

Mr. GORE. I would like to thank all the members of our first panel for getting us off to a good start. We appreciate your testimony very much. Thank you.

Mr. GORE. Our second panel is made up of the industry perspective and interest group perspective.

I would like to call to the witness table Jane Bloom, counsel for the Natural Resources Defense Council; Michael Hanchak, manager of research and development with CECOS International in Buffalo; Lucille DeClemente, vice president of Ubio, Inc.; and Paul Mraz, from Spectron, Inc., in Elkton, Md., representing the National Association of Solvent Recyclers.

I would like to welcome all of you to the witness table. Without objection, your entire statements will be included in full in the record. We invite you to summarize any portion of your statement that you feel is appropriate.

We would like to begin, Ms. Bloom, with you. Welcome.

STATEMENTS OF JANE BLOOM, COUNSEL, NATURAL RESOURCES DEFENSE COUNCIL; MICHAEL HANCHAK, MANAGER, RESEARCH AND DEVELOPMENT, CECOS INTERNATIONAL, INC.; LUCILLE DeCLEMENTE, VICE PRESIDENT, UBIO, INC., ACCOMPANIED BY RICHARD C. HITTINGER, ENVIRONMENTAL CHEMIST, THIBAULT & ASSOCIATES; AND PAUL MRAZ, SPECTRON, INC., ON BEHALF OF THE NATIONAL ASSOCIATION OF SOLVENT RECYCLERS

Ms. BLOOM. Thank you, Mr. Chairman.

I am an attorney with the Natural Resources Defense Council, which is a nonprofit environmental organization supported by over 40,000 members nationwide. I want to thank the committee for giving us an opportunity to testify on the need to provide incentives for the use and development of alternatives to land disposal, especially those which will minimize the serious threat posed by hazardous wastes to human health and the water that we drink.

One of the best documented major public health problems created by improper land disposal of hazardous waste is ground water contamination. I would like to give a little perspective on the rest of my talk by starting out with just a few facts on the serious potential of hazardous waste land disposal to contaminate drinking water.

Ground water supplies 50 percent of our drinking water. Yet, it is being contaminated through improper land disposal. According to EPA, 347 of the 418 abandoned land disposal sites that are the top priority sites on the Superfund list pose direct threats to drinking water supplies.

A recently released OTA report concludes that land disposal, which is responsible for 80 percent of our wastes, creates continued risks of contaminating ground water. The OTA report further documents the rather alarming discovery that 29 percent of the ground

water drinking water supplies of 954 U.S. cities with populations over 10,000 are contaminated.

EPA last year provided further evidence that organic chemicals, which are believed to occur in ground water as a result of improper land disposal, are detected in 45 percent of the public water systems that serve over 10,000 people and draw on ground water.

Clearly, the demonstrated serious potential of hazardous wasteland disposal to contaminate ground water provides strong evidence that this is an inadequate and inappropriate method for managing the majority of our wastes. It underscores the need to phase out land disposal to the extent practicable and to promote alternatives for managing hazardous waste.

As the chairman mentioned earlier this morning, there is really an emerging consensus among industry, State regulators, lawmakers, and environmental organizations that land disposal should be phased out and that incentives are needed in order to accomplish the shift to alternative waste management options.

However, EPA has not joined this consensus. The RCRA program provides little incentive to utilize alternative technologies and continues to make land disposal an economically attractive option.

Rather than tightening controls on land disposal methods, the EPA has expressly authorized continuation of these practices, which are known to result in ground water contamination. In particular, EPA's regulations under RCRA and the Safe Drinking Water Act perpetuate two widely used land disposal practices, landfilling and underground injection.

I would like to focus my remarks a little bit on underground injection because I think the committee has heard a great deal of testimony previously on landfilling, and underground injection is a serious but lesser known problem.

Underground injection of hazardous wastes is a potentially widespread practice which appears to be increasing. EPA projected last year that over ten billion gallons of hazardous waste are disposed of each year by this method. This, in comparison to landfilling, is a 2-to-1 ratio of underground injection to landfilling. So, it may be fair to say at this point that underground injection is perhaps the primary method of hazardous waste land disposal nationwide in terms of volumes of waste disposed.

Injection through what EPA terms a class IV well, which is injection either directly into or above an aquifer, which is considered an underground source of drinking water, can pose very serious threats to ground water sources of drinking water.

EPA deemed that form of land disposal to be inherently unsafe and originally proposed to ban it in 1979 but did not do so. The full extent of this problem is not even known because EPA has failed to adequately inventory the estimated 5,000 to 10,000 class IV wells that may exist nationwide.

However, recent data released by the agency indicate that approximately 238 million gallons of hazardous waste are being injected directly into underground sources of drinking water annually through only four wells. That is really all the data that they have at this point.

Rather than prohibiting this practice, EPA's current underground injection control, or UIC, regulations under the Safe Drink-

ing Water Act expressly authorize injection directly into underground sources of drinking water, until such time, 6 months after, a State UIC program has been approved by EPA. This is a process that is only now just beginning to get underway.

In addition, injection into existing shallow wells above drinking water aquifers, which is another form of class IV injection, is currently authorized indefinitely. There are presently no substantive requirements to protect ground water from hazardous waste migration from class IV injection wells. Therefore, there are no incentives for not using this form of disposal, which is a fairly inexpensive method once it is started up.

EPA's landfill regulations, as I mentioned, similarly sanction inadequate past practices that endanger drinking water sources and provide no real incentive for utilizing alternative waste management methods. The inadequacies in the EPA land disposal regulations with respect to landfills are described a little more fully in my written testimony, and if you have questions, I will be glad to answer them later.

Alternatives to land disposal, as you have been hearing this morning, currently do exist, but there are insufficient incentives for fully utilizing these alternatives. Viable alternatives that have been mentioned include source reduction, resource recovery, incineration, and waste treatment.

California estimates—and I am sure that the witnesses a little later will probably talk about this—that 75 percent of the wastes that are now landfilled in California could be handled by alternative means in the state-promulgated regulations requiring a phaseout on landfilling of those wastes for which alternatives do exist within the next couple of years.

Despite the recognized need for this shift away from land disposal, on a national basis there has been insufficient use of available alternative options. A recent study for EPA of nine large commercial waste management companies indicated that less than 25 percent of the resource recovery capacity of these firms was used in 1981, and that these firms used less than 80 percent of available incineration capacity, and only 56 percent of their chemical treatment capacity.

One major reason for this national failure to shift to alternatives has to be placed on EPA's continued opposition to using these alternatives and providing incentives and promoting them and their support for land disposal, as evidenced by the regulations.

Congressional leadership is clearly essential if we are going to minimize land disposal. Specifically, Congress must create incentives for utilizing existing and developing new alternatives.

We propose that there be direct restrictions on land disposal, as well as economic incentives for using these alternatives, government-sponsored research on alternatives and technical assistance to industry to identify how and how much waste can be treated. I would briefly like to run through those options in a little greater detail.

To provide adequate restrictions on land disposal, RCRA should be amended to provide that underground injection of hazardous wastes into or above underground sources of drinking water is

banned and that landfilling is only permitted for those wastes for which no alternative, environmentally safer option is available.

The Florio-Dingell bill, H.R. 2478, which is this year's successor to the House RCRA reauthorization bill, which passed overwhelmingly last year, substantially sets these goals and deserves support.

As far as economic incentives are concerned, the OTA recently recommended that there be established a Federal tail-end waste fee, a fee on generators, which would be based on the amount of waste generated and would impose higher fees on wastes that are land disposed than on those that are treated or recycled. This kind of system would provide economic incentives for utilizing alternatives and would also create an incentive for waste reduction.

A number of States do have some form of fee on generators right now, but we believe that a Federal system, perhaps administered by the States, is important if we are to establish uniformity of fees and avoid the creation of pollution havens.

A lot has been said about research, and I would like to add a slightly different perspective to the kind of research that I think needs to be done by EPA.

I would start out by pointing out that EPA's research and development efforts with respect to alternative land disposal, especially source reduction and recycle/reuse, are at a virtual standstill. Under the Carter administration the Agency's Division of Resource Recovery was cut back somewhat and then made into a branch. During the current administration, it was defunded and is now defunct.

Little is known regarding the degree to which utilization of alternatives could reduce the amount of waste that must be disposed of on a national basis. There hasn't really been any comprehensive national region-by-region analysis conducted to determine which industries and waste streams are amenable to recycle/reuse options.

Federally sponsored research on these and on treatment options, as well as technical assistance programs, are needed to provide industry with the technical information necessary to accomplish this shift to alternatives.

One example of a pilot program that has been fairly successful, given its limited scope, in terms of encouraging recycle/reuse is New York's Environmental Facilities Corp. program, which was mandated under the State's Industrial Materials Recycling Act.

The program is only 2 years old. It had a very tiny budget. Yet, the program developed the preliminary handbook identifying specific waste streams in the State that are economically feasible to recycle, it actively facilitated and underwrote a portion of the Northeast Waste Exchange, and provided technical assistance and consultation to industry on recycling and resource reduction generally.

As a result of this low budget program, EFC's annual report for last year indicates that industries in the State saved over a quarter of a million dollars and uncounted amounts due to the general assistance that it provided to industry.

That concludes my remarks. Thank you.

[The prepared statement of Ms. Bloom follows:]

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TESTIMONY OF JANE L. BLOOM

ON BEHALF OF THE

NATURAL RESOURCES DEFENSE COUNCIL, INC.

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

OF THE

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

HEARING ON

ALTERNATIVES TO LAND DISPOSAL OF HAZARDOUS WASTES

Washington, D.C.

May 4, 1983

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Introduction

The Natural Resources Defense Council (NRDC) is a national non-profit environmental organization supported by 40,000 members who are dedicated to the wise use of the nation's land and water resources. As an important part of our program, NRDC's Toxic Substances Control Project has actively participated in efforts to control the health and environmental risks posed by exposure to toxic substances, particularly hazardous wastes. A key objective of this effort has been to gain adequate protection for our groundwater supplies, which are increasingly threatened with contamination due to improper land disposal of hazardous wastes. In furtherance of these goals, NRDC's staff scientists and attorneys have carefully monitored EPA's implementation of the Resource Conservation and Recovery Act (RCRA), and the Safe Drinking Water Act (SDWA) which provide overlapping authority for EPA to regulate the impact of hazardous waste on drinking water supplies. We appreciate this opportunity to express our concerns regarding the need to provide incentives for the use and development of alternatives to land disposal which will minimize the serious threat posed by hazardous waste to human health and the water we drink.

I. Land Disposal of Hazardous Wastes Poses Serious Dangers of Drinking Water Contamination.

One of the best-documented, major public health problems created by improper hazardous waste management practices has been the contamination of groundwater, which supplies fifty percent of the nation's drinking water. The presence of chemical contaminants in underground sources of drinking water is generally believed to be the result of improper land disposal of hazardous waste. According to EPA, 347 of the 418 abandoned land disposal sites listed by EPA as most in need of cleanup under Superfund pose direct threats to drinking water supplies.[1] Moreover, a just-released report by the Office of Technology Assessment (OTA) concludes that land disposal, which is currently used for as much as 80 percent of all regulated hazardous wastes, creates continued risks of contaminating groundwater.[2]

Concern has increased as new and more comprehensive monitoring data indicate that the contamination of groundwater sources is a more serious and widespread problem than was originally thought. The OTA report documents the alarming discovery that 29 percent of the groundwater drinking water supplies of 954 U.S. cities with populations over 10,000 are

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1 OTA Report, at 5.

2 OTA Report, at 5.

contaminated.[3] In a Federal Register notice published last year, EPA announced that organic chemicals, many of which are believed to cause cancer and other life-threatening diseases in humans, have been detected in 45 percent of the public water systems that draw on groundwater and serve over 10,000 people.[4] The EPA data indicate that these chemicals have been detected in extraordinarily high concentrations, which exceed

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3 Technologies and Management Strategies for Hazardous Waste Control, Office of Technology Assessment, at 5 (March 1983)(hereinafter, "OTA Report").

4 47 Fed. Reg. 9351 (March 4, 1982). This figure may not be representataive of the magnitude of the problem, because water utilities do not routinely monitor for the presence of organics. Indeed, a recent GAO report indicates that regular sampling and monitoring by water suppliers to detect violations of the few contaminants included in the Interim Primary Drinking Water Standards under the SDWA is the exception rather than the rule in most states. Consequently, the extent of contamination may be considerably greater than indicated by EPA's figures. "States' Compliance Lacking in Meeting Safe Drinking Water Regulations," Report by the General Accounting Office to the Administrator of EPA, at 6 (1982).

by several orders of magnitude those found in surface drinking water sources.[5]

Clearly, the demonstrated, serious potential of hazardous waste land disposal to contaminate groundwater provides strong evidence that land disposal is an inadequate and inappropriate method for managing the majority of our nation's hazardous waste. Furthermore, it underscores the desperate need to phase out land disposal practices that endanger drinking water and to promote alternative methods for managing hazardous wastes.

II. There Is An Emerging Consensus That Land Disposal of Hazardous Wastes Should Be Phased Out to the Extent Feasible and Incentives Provided for Utilization and Development of Alternative Waste Management Options.

Based on the growing recognition and concern over groundwater contamination and other dangers posed by land disposal of hazardous wastes, there is an emerging consensus among industry, state regulators, and lawmakers and environmentalists that land disposal is the least desirable waste management alternative and should be phased out to the extent feasi-

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5 For example, trichloroethylene (TCE), a toxic organic chemical detected in wells across the country, has been found in concentrations as high as 35,000 parts per billion (ppb) in groundwater. 47 Fed. Reg. 9351 (March 4, 1982). This is over 200 times as high as the highest recorded concentrations (160 ppb) of TCE detected in surface water. Contamination of Ground Water by Toxic Organic Chemicals, Council on Environmental Quality, 36 (1981).

ble. Last year the House of Representatives articulated and endorsed this consensus when it overwhelmingly passed H.R. 6307, the RCRA Reauthorization bill. The bill if enacted would have required EPA to phase out the landfilling of certain hazardous wastes and ban the underground disposal of all hazardous wastes into or above drinking water aquifers. More recently, this consensus was articulated by the OTA, which concluded that one key Congressional goal with respect to hazardous wastes should be to:

> encourage development and use of technological alternatives to land disposal...to reduce risks resulting from releases of hazardous waste constituents into the environment.[6]

III. EPA Has Failed to Control Land Disposal Practices Known to Result in Groundwater Contamination.

As the OTA has found, EPA's RCRA program provides little incentive to utilize alternative technologies and continues to make land disposal an economically attractive option.[7] Rather than tightening controls on land disposal and promoting incentives for utilization of alternative methods, EPA has expressly authorized continuation of land disposal practices which are known to result in groundwater contamination. In particular, EPA's regulations under RCRA and the SDWA, perpetuate and promote two widely used land

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6 OTA Report at 25.

7 *Id.* at 11-12.

disposal practices, underground injection and landfilling, that endanger drinking water.

A. Underground Injection

Underground injection of hazardous wastes is a relatively inexpensive and potentially widespread land disposal practice which appears to be increasing. EPA projects that over 10 billion gallons of hazardous wastes are disposed of by underground injection annually. Moreover, data prepared for the Agency indicate that underground injection of hazardous wastes has overtaken landfill disposal by a ratio of 2 to 1.[8] Thus, underground injection may now be the primary method of hazardous waste land disposal nationwide.

Injection through what EPA terms a "Class IV well," i.e., disposal directly into or above an underground source of drinking water, can pose serious threats to groundwater sources of drinking water.[9] Consequently, EPA has deemed disposal of hazardous wastes through Class IV injection

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8 EPA data further indicate that ten times as much liquid waste is disposed by underground injection than is treated by incineration. Westat Inc., Report on the Telephone Verification Survey of Hazardous Waste Treatment Storage and Disposal Facilities Regulated Under RCRA in 1981, Chart 3, p.14 (November 11, 1982).

9 44 Fed. Reg. 34256 (June 14, 1979). In view of the serious potential threats to groundwater which can result from Class IV wells, EPA proposed to ban them entirely in 1979. 44 Fed. Reg. 23747 (April 20, 1979).

wells to be "inherently unsafe." The full extent of the problem is not yet known, however, because EPA has never adequately inventoried the 5,000-10,000 Class IV wells estimated by a 1979 EPA study to exist nationwide.[10] EPA recently estimated that approximately 238 million gallons of hazardous wastes are being injected directly into underground sources of drinking water annually, through only four wells, and 31,000 gallons are injected above sources through another eight wells.[11] These sparse figures seem to grossly underestimate and poorly evaluate the extent of the problem suggested by EPA's previous study.

Because of the dangers inherent in this method of disposing of hazardous waste, both RCRA and the SDWA require EPA to regulate underground injection of hazardous

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10 Temple, Barker and Sloane, Inc. Analysis of Costs: Underground Injection Control Regulati- , Class IV and Class V Wells. Prepared for U.S. Environmental Protection Agency, Office of Water Supply. May 1979. p. II-15.

11 Response of Defendant EPA to Plaintiff Environmental Defense Fund's Third Set of Interrogatories and Request for Production of Documents in Illinois v. Gorsuch at 6 (January 28, 1983)(hereinafter "EPA Response to Interrogatories").

waste.[12] Rather than effectively using the complementary provisions of each statute to create a comprehensive regulatory scheme for protecting drinking water from contamination by the injection of hazardous wastes, however, EPA has used this statutory overlap as an excuse to avoid effective regulation under both statutes.

The current Underground Injection Control (UIC) regulations under the SDWA expressly <u>authorize</u> injection <u>directly into</u> underground sources of drinking water. This practice is allowed to continue until six months after state UIC programs have been approved by EPA, a process that is only now getting underway.[13]

In addition, injection into existing shallow wells above drinking water aquifers, is authorized until such time

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12 To address these concerns, Section 3004 of RCRA requires EPA to promulgate regulations for such disposal facilities. Section 1006 further requires EPA to integrate its implementation of RCRA with pertinent provisions of the Safe Drinking Water Act (SDWA), which is designed to ensure protection of drinking water supplies. The SDWA's Underground Injection Control (UIC) provisions require EPA to prohibit underground injection practices which endanger drinking water.

Because RCRA and the SDWA overlap, EPA purportedly coordinates its implementation of the two statutes by regulating aboveground ancillary facilities and activities associated with injection of hazardous waste under RCRA, and injection wells under the SDWA.

13 To date, only seven state UIC programs have been approved by EPA. At least twelve states have expressed no intention of ever applying for primacy. EPA has not promulgated programs for those and other states lacking federally-approved UIC programs, although required to do so under the SDWA. EPA Response to Interrogatories at 11-13.

as EPA promulgates permitting requirements for Class IV hazardous waste injection wells. Promulgation of Class IV permitting requirements under the SDWA has been "reserved" since 1980, however, and no date has been set for their issuance. Moreover, EPA has failed to include requirements for this class in its land disposal permit regulations under RCRA. By reserving indefinitely the requirements for Class IV hazardous waste injection wells under the SDWA, and failing to promulgate these requirements under RCRA, EPA has created a "Catch-22" situation, in which there are presently no substantive requirements applicable to underground injection of hazardous waste that endangers drinking water.

The only controls imposed by EPA on underground injection of hazardous waste into Class IV wells at the present time are the grossly inadequate interim status standards for hazardous waste facilities.[14] As the GAO reported over a year ago to Congress, these standards are

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14 EPA does not require injection wells permitted under the UIC program to obtain a RCRA permit. Removing RCRA protection from underground injection activities leaves a gap, however, because permitting under the SDWA does not begin until EPA has authorized states to issue UIC permits. To fill the gap, however, EPA has made certain of the interim status requirements of the RCRA program applicable to Class IV and Class I hazardous waste injection wells until state programs are authorized.

Once state UIC programs have been approved, RCRA permitting requirements will not apply to underground injection hazardous waste facilities. Permitting standards under the UIC program, which have yet to emerge, will provide the only protection against contamination of groundwater by Class IV hazardous waste injection wells.

largely administrative and provide no significant protection against the serious dangers posed by hazardous waste.[15] To make matters worse, EPA has made the groundwater monitoring requirements imposed under interim status inapplicable to UIC facilities.[16]

B. Landfilling

According to recent EPA estimates, at least 2.2 billion gallons of waste annually are disposed of in landfills. Groundwater contamination has been widely documented at existing landfills. Moreover, the weight of continually mounting evidence indicates that even "state-of-the-art" landfills -- containing double liners, leachate collection and removal systems and leak detection systems -- cannot

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15 "Hazardous Waste Facilities With Interim Status May Be Endangering Public Health and the Environment," Report to Congress by the General Accounting Office, at 18-21 (1981).

16 45 Fed. Reg. 33219 (May 19, 1980).

permanently prevent migration of wastes into the environment and into groundwater.[17] As EPA acknowledges,

> Most land disposal units, however well-designed, will eventually leak after closure to some extent. Furthermore, many existing units lack adequate liners and may already be leaking.[18]

Emphasizing these concerns, the vast majority of those experts, including state regulatory agencies, environmental scientists and engineers, testifying last year before this Committeee, seriously questioned the environmental soundness of all landfills, new and existing, and recommended that they be phased out to the extent feasible.[19]

However, far from imposing regulatory controls that will restrict landfilling and encourage alternative management options, the agency last year adopted land disposal regulations that sanction inadequate past landfill practices and provide incentives for continued heavy reliance on landfill disposal of hazardous wastes.

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17 See, e.g., Peter Montague, Four Secure Landfills in New Jersey -- A Study of the State of the Art in Shallow Burial Waste Disposal Technology, Dept. of Chemical Engineering and Center for Energy and Environmental Studies, Princeton University (Princeton, New Jersey, draft of February 1, 1982.) (Recent study examining four "state-of-the-art" secure landfills constructed within the last four years in New Jersey found leakage at all four sites.)

18 47 Fed. Reg. 32313

19 Hearings before the House Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology, November 30, and December 8, 1982.

Specifically, EPA's regulations have been widely criticized for:

1) exempting existing inadequate, unlined landfills from the requirement to install liners and leachate collection systems necessary to prevent groundwater contamination;

2) exempting unused portions of existing landfills from the requirement to install liners and leachate collection systems if such portions are used prior to permitting;

3) exempting certain new landfills from meeting design and operating standards and groundwater monitoring requirements;

4) allowing landfills to be located on hazardous 100-year floodplains;

5) not requiring location of landfills to protect drinking water sources;

6) failing to ensure stringent and comprehensive monitoring of groundwater to detect contamination; and

7) not requiring cleanup until groundwater contamination is already significantly advanced[20]

IV. Alternatives to Land Disposal Currently Exist But There Are Currently Insufficient Incentives for Fully Utilizing Such Alternatives.

Land disposal of hazardous wastes can and should be phased out to the maximum extent technologically feasible. Viable alternatives to land disposal, including source reduction, resource recovery, incineration and waste treat-

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20 See OTA Report at p.12; Comments of the Natural Resources Defense Council on EPA's Interim Final Permit Standards for Land Disposal Facilities, November 23, 1982.

ment, currently exist. For example, California estimates that 75% of the wastes that are currently being landfilled in the state can be managed by alternative means. Last year the state promulgated regulations requiring a phase-out by 1985 on landfilling of all of those wastes for which alternatives exist.

Despite the recognized need for a shift away from land disposal on a nationwide basis, however, there has been insufficient use of available alternative hazardous waste management options. A recent study for EPA of nine large commercial waste management companies indicates that less than 25% of resource recovery capacity in these firms was used in 1981. Moreover, these firms utilized less than 80% of available incineration capacity and only 56% of chemical treatment capacity.[21]

The reason for this national failure to shift to environmentally preferable waste management alternatives is all too clear. In spite of the consensus favoring alternatives, EPA continues to oppose their use and support land disposal. The agency recently testified:

> We believe that most wastes can be satisfactorily managed in the land and that it can be done with a reasonable margin of safety more cheaply in this manner. In keeping with the general philosophy stated

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21 Booz-Allen & Hamilton, Review of Activities of Major Firms in the Commercial Hazardous Waste Management Industry: 1981 Update, for the Office of Policy Analysis, EPA (1982).

> earlier, it may be that recycling or destruction is preferable from a strictly health and environmental standpoint, but for many wastes, the reduction in risk achieved is probably marginal and may not be worth the cost.[22]

Moreover, as further evidence of the agency's commitment to this outmoded policy, the agency's resource recovery division was de-funded and is now defunct. Consequently, the agency has devoted very little of its research and development money to alternative technologies.

V. Congress Must Act Now to Phase Out Land Disposal of Hazardous Wastes and To Provide Incentives for Shifting to Environmentally Preferable Alternatives.

Congressional leadership is essential if we are to minimize land disposal and provide incentives for alternative, environmentally safer waste management nationwide. So long as land disposal is kept the cheapest readily available option, there simply will not be sufficient incentive to shift to alternatives. Specifically, Congress must create incentives for utilization of existing and development of new alternatives by:

1) directly restricting land disposal;

2) providing economic incentives for using alternatives; and

3) sponsoring government research on alternatives and technical assistance to industry to identify how

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22 Testimony of Rita Lavelle, Assistant Administrator, EPA, before the House Subcommittee on Natural Resources, Agriculture, Research and Environment, December 16, 1982.

(and how much) waste can be treated, reduced or recycled.

A. Restrictions on Land Disposal

Legislative action is needed to ensure that land disposal of hazardous waste is minimized to the maximum extent practicable. In particular, RCRA should be amended to provide that underground injection of hazardous waste into or above underground sources of drinking water is banned and that only those wastes for which no alternative, environmentally safer option is available are permitted to be landfilled. The Florio-Dingell bill, H.R. 2478, successor to last year's House RCRA Reauthorization bill, substantially sets these goals. The bill would prohibit underground injection of hazardous wastes into or above underground sources of drinking water within 6 months of enactment. The bill would also require EPA to establish a schedule for prohibiting the landfilling of certain enumerated and other hazardous wastes based on their hazard characteristics, the ability of a landfill to contain them, and the availability of alternatives.

B. Economic Incentives

In addition to imposing direct restrictions on land disposal, as described above, economic incentives are needed to encourage use of alternatives. The OTA recently recommended establishment of a federal "tail end" waste fee

system, which would be based on the amount of waste generated and would impose higher fees on wastes disposed of than on those treated or recycled. The system would provide economic incentives for utilizing alternatives to land disposal. Moreover, the system would create an incentive for waste reduction generally.[23] A number of states already have some form of fee on waste generators[24], but a federal system is needed to establish uniformity of fees and to avoid creation of "pollution havens".

C. Research on Alternatives and Technical Assistance to Industry

As noted above, EPA's research and development efforts with respect to alternatives to land disposal, especially source reduction and recycle/reuse, are at a virtual standstill. Little is known regarding the degree to which utilization of alternatives could reduce the amount of waste

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23 *See* OTA Report at 75-78.

24 Twelve states, including California, New Jersey, Florida, Missouri, and Ohio impose fees on waste generators. OTA Report at 365. Additional economic incentives that have been proposed for federal Congressional consideration include low interest federal loans and tax breaks to help finance capital investment in new or modified equipment and facilities that reduce or treat wastes.

Some states (e.g., Wisconsin) have already established tax incentives to help firms meet capital needs for improved hazardous waste management. A Survey and Analysis of State Policy Options to Encourage Alternatives to Land Disposal of Hazardous Waste, National Conference of State Legislatures, 31 (July 1981).

that must be disposed of nationwide. Nor has any comprehensive national, region-by-region analysis been conducted to determine which industries and waste streams are amenable to recylce/reuse options. Federally sponsored research on these and on treatment options as well as technical asistance programs are needed to provide industry with the technical information necessary to accomplish the shift to alternatives.

Such technical assistance efforts have proven successful in the few states which have initiated pilot programs to encourage the use of recycle/reuse options. New York's Environmental Facilities Corporation (EFC), a public authority, for example, has for the last two years operated the state's statutorily-mandated Industrial Materials Recycling Program. Under the program EFC has developed a preliminary handbook identifying specific waste streams in the state which are economically feasible to recycle; actively facilitated waste exchanges; and provided technical assistance and consultation to industry on recycling and source reduction. As a result of this low-budget program, EFC reports that industries in the state saved over a quarter of a million dollars in FY1981-82.[25]

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25 Industrial Materials Recycling Act Annual Report, New York State Environmental Facilities Corp. (1982). California has an even more aggressive program mandated by state law. The state not only provides waste exchange services and technical assistance but also requires generators to justify their choice of disposal over recycling for a waste stream.

Mr. GORE. Thank you very much.

We have another vote on the floor, an important one that is likely to be close. With your indulgence I say to the other members of this panel we will recess for about 10 minutes and then come back and begin with you, Mr. Hanchak.

[Recess.]

Mr. GORE. The subcommittee will come back to order.

We apologize for the inconvenience and delay.

Mr. Hanchak, we will proceed with your statement. If you care to summarize any portion of it, feel free to do so. Welcome.

Mr. HANCHAK. Thank you, Mr. Gore, and members of the committee.

CECOS International is a firm which specializes in the management of chemical waste. Our corporate headquarters is located in Buffalo, N.Y.

CECOS International operates treatment, recovery and disposal facilities throughout the East, Midwest and Southeast areas of the United States. Through its recent acquisition by Browning Ferris Industries of Houston, Tex., CECOS now has the fiscal strength to move expeditiously to implement its long-standing commitment to the development of the most technologically advanced approaches to the management of chemical and industrial waste.

In April 1981 CECOS International submitted a 10-year technology plan to the Department of Environmental Conservation of the State of New York. This plan represents the consolidation of the research, development, technology and business plans that the company had previously designed.

The 10-year plan was submitted to the New York State DEC in response to their decision that land burial of untreated chemical wastes would not be permitted in New York after 1985. The CECOS 10-year plan demonstrates how our company will implement and develop new, advanced technologies for waste treatment, recovery and destruction and, simultaneously, insure maximum detoxification and volume reduction of waste materials within the timeframe put forth by the DEC.

The plan represents a $55 million commitment by CECOS in New York State alone. The CECOS 10-year plan was developed for New York, although this plan is now the prototype for the development of advanced waste management technologies at other CECOS sites across the United States.

The 10-year technology plan presents CECOS' comprehensive program leading to the implementation of appropriate technology for the environmentally sound and economically reasonable treatment, recovery, detoxification and disposal of industrial and hazardous waste.

The plan, as developed, is the culmination of an exhaustive study that examined the industrial and hazardous waste market, the availability and desirability of technology, and the feasibility of generating revenue sufficient to justify technology implementation. Preparation of the plan included:

(*a*) A technical evaluation of systems presently available to manage industrial and hazardous wastes;

(*b*) An appraisal of the market relative to the types of waste products available and an evaluation of industrial trends;

(*c*) A survey of present practices in the hazardous waste industry;

(*d*) An overview of technologies and management systems presently employed by CECOS International;

(*e*) Selection and evaluation of technologies appropriate to deal with existing volumes of specific industrial and hazardous waste categories;

(*f*) An assessment of existing and proposed federal and state legislation relative to the waste management field;

(*g*) An assessment of marketing considerations of alternative industrial and hazardous waste management systems, including expected environmental and economic impact;

(*h*) An evaluation of financing programs; and finally,

(*i*) legal considerations relative to program implementation.

The methodology employed to develop the 10-year plan to CECOS' New York operation emphasized the identification of appropriate technology on a regional basis. Hence, the plan developed reflects the needs not only of New York State but this facility's effective service area.

Following an evaluation of the data base, appropriate planning assumptions were developed that took into consideration factors such as markets, competitors, economics, regulatory, socioeconomic and environmental.

The plan, as presented, provides detail relative to the character of intended facilities, site utilization, management programs, monitoring systems, community programs and research and development.

Regarding proposed technological processes, CECOS International evaluated 52 hazardous waste treatment, recovery and disposal processes in order to determine which would be the most appropriate and feasible for implementation at its New York site over the next 10 years.

They were evaluated and assigned a feasibility of implementation rating based on the following criteria: technological feasibility; economic practicality; sociological impacts and anticipated community response; regulatory requirements and probability of permitting, environmental impacts, market amenability, competitive climate, and the present use of the process by CECOS.

CECOS selected 16 of these processes as feasible for implementation at its New York site over the next 10 years. A majority of the proposed processes involve extensive volume and toxicity reduction in the wastes, recovery of metals and other reusable commodities from the wastes, or the manufacture of supplemental fuels from the waste.

CECOS feels that two of the processes represent especially dramatic and significant breakthroughs in the treatment, recovery and disposal of hazardous waste: supercritical thermal oxidation and the hydrometallurgical recovery process for the recovery of free metals.

The SCW thermal oxidation process operates somewhat analogous to a high temperature incinerator. However, to refer to it as incineration of wastes would be totally misleading.

This process is an advanced thermal oxidation system concept based on physical and chemical conditions never before applied to the chemical waste management field. The SCW thermal oxidation

process is being developed as a joint venture by CECOS International with Modar, Inc. of Massachusetts.

This process can destroy extremely toxic organic wastes, such as PBC's, pesticides and dioxin. It also represents a wide range of improvements over current thermal destruction technology:

(*a*) The potential for undesirable air emissions from SCW is almost nonexistent;

(*b*) Any inorganic materials present in the feed materials are efficiently separated from the effluent;

(*c*) The process favors energy and heat recovery; and

(*d*) The system operates at much lower temperatures than and uses much less energy than traditional incinerators.

Finally, it appears that the system can be made portable, which would allow its installation and use at a waste generator's operations or at abandoned hazardous waste sites.

The unit is being designed to handle highly toxic and hazardous organic solids, liquids, and sludges. This process will also be able to effectively treat organic waste contaminated with inorganic materials, such as heavy metals. These wastes now present a significant problem for traditional methods of incineration.

Regarding the hydrometallurgical processes, it has been estimated that the United States imports 64 percent of its nonferrous metals. The country is nearly totally dependent on imports for 23 strategic metals. Many of these metals cannot be replaced in the various industrial processes in which they are now used.

CECOS International is designing and implementing a hydrometallurgical recovery program which will allow the recovery of strategic and other metals from various industrial wastes. The recovery process designed by CECOS will provide an alternative to land burial for many wastes.

CECOS feels that this hydrometallugical recovery process will become increasingly vital in the future. Many sources of strategic metals, such as Turkey, South Africa, and Zimbabwe, have unstable political situations which make United States reliance on their supplies very risky.

Furthermore, the United States is currently importing a great deal of chromium from the Soviet Union. Chromium is vital to the national defense effort. CECOS feels that a sound metal-recovery program will make a positive contribution to national defense and to the industries which rely on these metals in the manufacture of their products.

Additional processes in the CECOS 10-year plan include durachem/SM I and II, which will be developed as solidification processes for inorganic and organic waste residues, respectively. The residue from the durachem II process will be used as the raw material for the CECOAL/TM process.

CECOAL/TM will be a solid fuel supplement designed from organic waste detoxified utilizing the durachem/SM II process.

Volatilization pretreatment will vaporize and collect volatile organic constituents from waste materials. These collected residues will then be replaced as fuels.

Solid Chemical Residue Facilities, SCRF, will be designed to dispose of the detoxified and volume-reduced process residues from

the CECOS advanced technologies. This industrial waste-management facility will handle only pretreated waste materials.

We have been asked specifically to suggest methods through which the Congress could encourage the development, implementation, and use of advanced waste-management technologies. There are three specific suggestions that we would like to make to the Congress today.

First, strong Federal legislation must be enacted to insure the utilization of those high-technology processes that have been and can be developed. In many instances, the use of more efficient, advanced technologies will be more costly to the waste generator. Their use must, therefore, be encouraged by enacting appropriate legislation.

It simply will not be practicable, from a business standpoint, for the waste management industry to develop new technologies which are only mandated for use on a piecemeal, State-by-State basis.

Specific waste streams must be directed to these technologies on a Federal basis. Certainly, the cost effectiveness of these technologies must be within reach, but with equal certainty, the environmental protection afforded by sophisticated methods must be encouraged.

Second, the siting issue must be addressed, possibly on a Federal basis. We cannot expect that the public will be any more eager to have a high-technology waste plant in their community than they are to have a landfill. Indeed, the arduous permit hearings faced by the country's two PCB incinerators reinforce this concern. Perhaps a needed legislation will be analogous to the recent Federal mandate that a regional site must be developed to handle radioactive wastes.

No matter what approach is taken, the responsibility for the treatment of chemical wastes must be more equitably allocated to the many regions of the country where these wastes are generated. Private industry must have a reasonable opportunity to implement the sophisticated waste treatment systems presently under investment and development.

Finally, an aggressive program of waste-related research and development grants should be made available to the academic community and the private sector. This will focus the scientific and creative energies of our country on the chemical waste dilemma. The Government, educational institutions, and industry should work together within this program. CECOS International would be most eager to participate in this type of forum.

I would like to add that I would highly recommend that a very strong peer review system be incorporated in any EPA funding program to include industrial representatives from the waste-management industry, to assure that your tax dollars will be effectively spent.

Finally, I thank you for the opportunity to address you today. I would be most pleased to answer any questions that you might have.

[The prepared statement of Mr. Hanchak follows:]

PREPARED STATEMENT OF MICHAEL HANCHAK, MANAGER, RESEARCH AND DEVELOPMENT, CECOS INTERNATIONAL, INC.

CECOS International is a firm which specializes in the management of chemical waste. Our corporate headquarters is located in Buffalo, New York. CECOS International operates treatment, recovery and disposal facilities throughout the East, Mid-West and Southeast areas of the United States. Through its recent acquisition by Browning Ferris Industries of Houston, Texas, CECOS now has the fiscal strength to move expeditiously to implement its long-standing commitment to the development of the most technologically advanced approaches to the management of chemical and industrial waste.

In April, 1981, CECOS International submitted a Ten Year Technology Plan to the Department of Environmental Conservation of the State of New York. This plan represents the consolidation of the Research, Development, Technology and Business Plans that the company had previously designed. The Ten Year Plan was submitted to the New York State DEC in response to their decision that land burial of untreated chemical wastes would not be permitted in New

York State after 1985. The CEOCS Ten Year Plan demonstrates how our company will implement and develop new, advanced technologies for waste treatment, recovery and destruction and, simultaneously, insure maximum detoxification and volume reduction of waste materials within the time frame put forth by the DEC. The Plan represents a $55 million commitment by CECOS in New York State alone. The CECOS Ten Year Plan was developed for New York, although this plan is the prototype for the development of advanced waste management technologies at other CECOS sites across the United States.

The Ten Year Technology Plan presents CECOS' comprehensive program leading to the implementation of appropriate technology for the environmentally sound and economically reasonable treatment, recovery, detoxification, and disposal of industrial and hazardous waste. The Plan as developed is the culmination of an exhaustive study that examined the industrial and hazardous waste market, the availability and desirability of technology, and

the feasibility of generating revenue sufficient to justify technology implementation. Preparation of the plan included:

a) a technical evaluation of systems presently available to manage industrial and hazardous wastes;

b) an appraisal of the market relative to the types of waste products available and an evaluation of industry trends;

c) a survey of present practices in the hazardous waste industry;

d) an overview of technologies and management systems presently employed by CECOS International;

e) selection and evaluation of technologies appropriate to deal with existing volumes of specific industrial and hazardous waste categories;

f) an assessment of existing and proposed Federal and State Legislation relative to the waste management field;

g) an assessment of marketing considerations of alternative industrial and hazardous waste management systems, including expected environmental and economic impact;

h) an evaluation of financing programs; and

i) legal considerations relative to program implementation.

The methodology employed to develop the Ten-Year Plan for to CECOS' New York Operation emphasized the identification of appropriate technology on a regional basis. Hence, the plan developed reflects the needs not only of New York State, but this facility's effective service area. Following an evaluation of the data base, appropriate planning assumptions were developed that took into consideration factors such as markets, competitors, economics, regulatory (legislative), socioeconomic and environmental.

The plan, as presented, provides detail relative to the character of intended facilities; site utilization; management

programs; monitoring systems; community programs; and research and development.

Proposed Technological Processes:

CECOS International evaluated 52 hazardous waste treatment, recovery and disposal processes in order to determine which would be the most appropriate and feasible for implementation at its New York site over the next ten years. They were evaluated and assigned a feasibility of implementation rating based on the following criteria: technological feasibility; economic practicality; sociological impacts and anticipated community response; regulatory requirements and probability of permitting; envrionmental impacts; market amenability; competitive climate; and the present use of the process by CECOS.

CECOS selected sixteen of these processes as feasible for implementation at its New York site over the next ten years.

A majority of the proposed processes involve extensive volume and toxicity reduction in the wastes, recovery of metals and other

reusable commodities from the wastes, or the manufacture of supplemental fuels from the waste. CECOS feels that two of the processes represent especially dramatic and significant breakthroughs in the treatment, recovery and disposal of hazardous waste: SCW thermal oxidation and the Hydrometallurgical Recovery Process for the recovery of free metals.

The SCW thermal oxidation process operates somewhat analogous to a high temperature incinerator; however, to refer to it as incineration of wastes would be totally misleading.

This process is an advanced thermal oxidation system concept based on physical and chemical conditions never before applied to the chemical waste management field. The SCW thermal oxidation process is being developed as a joint venture by CECOS International with Modar, Inc. of Massachusetts.

This process can destroy extremely toxic organic wastes such as PCBs, pesticides and dioxin. It also represents a wide range of improvements over current thermal destruction technology:

- The potential for undesirable air emissions from SCW is almost non-existent.
- Any inorganic materials present in the feed materials are efficiently separated from the effluent.
- The process favors energy and heat recovery.
- The system operates at much lower temperatures than (and uses much less energy) traditional incinerators.

Finally, it appears that the system can be made portable which would allow its installation and use at a waste generator's operations or at abandoned hazardous waste sites.

The unit is being designed to handle highly toxic and hazardous organic solids liquids and sludges. This process will also be able to effectively treat organic waste contaminated with inorganic materials such as heavy metals. These wastes now present a significant problem for traditional methods of incineration.

Hydromettalurgical Recovery Processes

It has been estimated that the United States imports 64% of its non-ferrous metals. The country is nearly totally dependent on imports for 23 strategic metals. Many of these metals cannot be replaced in the various industrial processes in which they are used.

CECOS International is designing and implementing a Hydromettalurgical Recovery Program which will allow the recovery of strategic and other metals from various industrial wastes. The recovery process designed by CECOS will provide an alternative to land burial for many wastes.

CECOS feels that this Hydromettalurgical Recovery Process will become increasingly vital in the future. Many sources of strategic metals such as Turkey, South Africa, and Zimbabwe (Rhodesia) have unstable political situations which make United States reliance on their supplies very risky.

Furthermore, the United States is currently importing a great deal of chromium from the Soviet Union. Chromium is vital to the national defense effort. CECOS feels that a sound metal recovery program will make a positive contribution to national defense and to the industries which rely on these metals in the manufacture of their products.

Other Processes in the CECOS Ten Year Plan include:

Durachem^{SM} I and II which will be developed as solidification processes for inorganic and organic waste residues, respectively. The residue from the Durachem II process will be used as the raw material for the CECOAL^{TM} process.

CECOAL^{TM} will be a solid fuel supplement developed from organic waste detoxified utilizing the Durachem^{SM} II process.

Volatilization Pretreatment will vaporize and collect volatile organic constituents from waste materials. These collected residues will then be recycled as fuels.

Solid Chemical Residue Facilities (SCRF) will be designed to dispose of the detoxified and volume reduced process residues from the CECOS advanced technologies. This industrial waste managment facility will handle only pretreated waste materials.

We have been asked specifically to suggest methods through which the Congress could encourage the development, implementation and use of advanced waste management technologies. There are three specific suggestions that we would like to make to the Congress today. First, strong federal legislation must be enacted to insure the utilization of those high technology processes that have been and can be developed. In many instances, the use of more efficient, advanced technologies will be more costly to the waste generator. Their use must, therefore, be encouraged by enacting appropriate legislation. It simply will not be practicable, from a business standpoint, for the waste management industry to develop new technologies which are only mandated for use on a piecemeal, state by state basis. Specific waste streams

must be directed to these technologies on a federal basis. Certainly, the cost effectiveness of these technologies must be within reason, but with equal certainty, the environmental protection afforded by sophisticated methods must be encouraged.

Secondly, the siting issue must be addressed - possibly on a federal basis. We cannot expect that the public will be any more eager to have a high technology waste plant in their community than they are to have a landfill. Indeed, the arduous permit hearings faced by the country's two PCB incinerators reinforce this concern. Perhaps a needed legislation will be analagous to the recent federal mandate that a regional sites must be developed to handle radioactive wastes.

No matter what approach is taken, the responsibility for the treatment of chemical wastes must be more equitably allocated to the many regions of the country where these wastes are generated. Private industry must have a reasonable opportunity to implement

the sophisticated waste treatment systems presently under investment and development.

Finally, an aggressive program of waste related research and development grants should be made available to the academic community and the private sector. This will focus the scientific and creative energies of our country on the chemical waste dilemma. The government, educational institutions and industry should work together within this program. CECOS International would be most eager to participate in this type of forum.

Thank you for the opportunity to address you today. I would be most pleased to answer any questions that you might have.

Mr. GORE. Thank you very much. We will hold our questions until the panel has been completed.

I would like to recognize Congresswoman Schneider to introduce our next witness.

Mrs. SCHNEIDER. Thank you, Mr. Chairman.

I am particularly proud to introduce Lucille DeClemente, who is with the Ubio corporation. It is one of Rhode Island's true success stories, in setting the pace not only for the State of Rhode Island but also the country's technology insofar as the jewelry industry is concerned, in developing innovative methods of reducing hazardous wastes.

As many of you know, much of the waste that is generated in the jewelry manufacturing process involves cyanide and other heavily toxic chemicals. Mrs. DeClemente's corporation has been involved in pursuing a very interesting technological approach.

I am looking forward to her testimony, to really prove and to show how a company can be environmentally responsible and, at the same time, economically profitable.

We welcome you. Please proceed.

Mrs. DECLEMENTE. Thank you, Congresswoman Schneider.

Mr. Chairman and distinguished committee members, I want to give you a little background about Ubio, Inc. I am sitting here saying I really don't know what I am doing here, but I would like to present it as Ubio is.

Ubio, Inc., is the exclusive licensee for the manufacture of Christian Dior and Grozier jewelry for America and Canada. Our jewelry combines high fashion with superb elegance and the utmost quality, and I do emphasize quality.

We are not as the traditional jewelry industry in Rhode Island in that we do not deal with volume or piecework merchandise. We deal with small quantities, in 10's, 40's, 50's. We have a very extensive line, which changes twice a year.

We have a time-control system which allows us to have our quality standards and also to guarantee to our customer 5 years unconditionally that she can return any piece of merchandise which should fall apart or wear out for plating or anything like this. I tell you this because Ubio is proud of the work, its new facilities, of its product, and what it is doing.

Our manufacturing facility is located within the Howard Industrial Park in Cranston, R.I. The present building is 15,000 square feet in size and sits on 3 acres of land. As of June 1, 1983, Ubio will be breaking ground and its present facility will be expanded by 12,000 square feet. Ubio currently employs 80 employees. When the expansion is completed, hopefully, if all goes well, by January 1, 1984, we hope to employ 120 to 150 employees.

About 3 years ago, when we were contemplating building and moving our location, we decided to check into existing regulations for air and waste water pollution. Thibault Associates was referred to us in terms of this direction.

We contacted them as to the advantages, the disadvantages, the costs, of course, of putting the necessary pollution controls into our new facility. After much deciding and contemplation we decided yes, for two very important reasons.

The first reason was financial. We were told the cost to install the pollution controls over a period of time would, if not pay for themselves, considerably reduce our total operating costs for heat and water.

The second reason was quality. Ubio has always tried to maintain a clean, updated work environment for its employees and its product. The instituting of air and water controls could only continue our total commitment to our employees, to our product and, of course, to the environment.

In terms of air controls, Ubio has two. One is called a baghouse system and the other is called a makeup air unit.

The baghouse system is located within our polishing department. Essentially what it does is takes any of the air that is exhausted from within that department, sends it through a system in a baghouse unit, cleans it, purifies it, heats it, and returns it back into the building.

The other system, the makeup air unit, is exactly what the term implies. It cools or heats the air that is brought in from the outside that has been exhausted out of the facility. It cools or it heats it, depending upon the time of the year and what our platers have registered the time control on. Sometimes they want it very cool in there and sometimes they like it warm, but it just continually makes up the air.

The result of this was there was a reduced gas consumption and, of course, a reduction in terms of our heating costs and our electrical costs.

In terms of what you all are interested in, our water waste controls, Ubio uses the Providence method. The Providence method is a type of source reduction. Today, I have brought with me from

Providence, Mr. Richard Hittinger, from Thibault Associates, who is our technical adviser for everything. He will elaborate on this type of source reduction at Ubio for our Providence method.

What I would like to say, however, before he begins is that Ubio is quite pleased with the outcome of the Providence method system that we installed because we had more positive results than we had anticipated. There were actually six results.

The first, the Providence method is a fairly low-cost system to operate.

The second, we were able to maintain the best possible solution stability. Less dollars were spent to replenish metals in the plating baths.

The third, with modification our system produces no hazardous sludge.

The fourth, with so many efficient water rinses, the overall quality of our work was greatly improved. For any of you who know anything about plating and metal bonding to another metal, you know that cleaning is very, very important within the plating cycle. So, the water rinses that were used with this Providence method did increase the quality of our product immensely.

The fifth, the dollar savings in water and sewer charges were substantially decreased while production increased by a factor of almost $2 million.

The sixth, the conservation of water. We definitely saved on the use of water. In our old facility we used 5.3 million gallons of water per year. In our new facility, with the Providence method and also with the recycling of water used only for cooling, we currently use only 2.25 million gallons of water per year. That is a substantial savings.

Now I would like to turn over the technical aspect to Mr. Richard Hittinger from Thibault Associates.

Mr. HITTINGER. Thank you, Mrs. DeClemente.

Mr. Chairman, members of the committee, the system that Ubio, Inc., has installed to virtually eliminate the generation of hazardous wastes is a combination of in-process source reduction through the use of the Providence method, followed by conventional batch treatment and stabilization of unrecoverable wastes. In this system, uncontaminated flowing rinses are discharged to continuous pH neutralization.

The Providence method was developed by the engineering firm of Thibault & Associates in cooperation with the Manufacturing Jewelers and Silversmiths of America, under a grant from the Economic Development Administration of the U.S. Department of Commerce.

The in-process modifications in Ubio consist of highly efficient rinse stations which use aeration to improve rinsing efficiency and which flow at a slow, metered rate. Placement of between one and three counterflowing rinse stations following each source of contamination has produced a concentrate which is being reused directly into plating baths to replace bath evaporation, or batch treated, if not recoverable. As Mrs. DeClemente mentioned earlier, this leads to a more constant plating bath chemistry while also reducing the consumption of plating bath chemicals.

Batch treatment of unrecoverable concentrates includes batch alkaline chlorination of cyanides and batch metals precipitation and settling. Both processes are effective and widely used methods of treating this type of waste water.

Due to a simple calcium/magnesium stabilization, the sludge generated by the metals precipitation has been tested and declared to be nonhazardous by the Rhode Island Department of Environmental Management; that is, it has been delisted.

In summary, the Providence method, a method of source reduction developed through a government-industry technology transfer program, is being used at Ubio, Inc., and many other electroplating facilities in the Rhode Island area in conjunction with resource recovery and traditional treatment processes to produce an effluent which exceeds Federal pretreatment limitations while virtually eliminating the generation of hazardous wastes and provides significant secondary benefits to Ubio, Inc. Application of the Providence method to other industries is likely, although its application has not been widely studied.

Thank you.

Mr. GORE. Thank you. I really think that is an example of how systems analysis and engineering for reduction of waste at the source can accomplish several goals simultaneously—pollution control, reduction in the amount of hazardous wastes—and, at the same time, some secondary economic benefits to the firm involved.

I predict that companies all across the United States are going to find such secondary benefits as they apply systems analysis and new engineering approaches to reduce waste at the source. Your pioneering work at Ubio is very helpful to our subcommittee in the study of this matter.

Mr. Paul Mraz is from Spectron, Inc., representing the National Association of Solvent Recyclers. Solvents, of course, are a particular problem in landfills because many of them, particularly the halogenated solvents can eat right through the clay liners that are supposed to be impermeable. They are not, and recycling is particularly important for them.

Mr. Mraz, welcome.

Mr. MRAZ. Thank you, Mr. Gore.

May it please the committee, my name is Paul Mraz. By way of familiarizing you with the type of individual who participates in the solvent recycling industry, I happen to have a bachelor of science in chemical engineering from Case Institute of Technology and a degree in nuclear engineering from Oak Ridge, Tenn. Not that all solvent recyclers have degrees in nuclear engineering, of course.

I worked for 8 years with the Du Pont Co. in their research and engineering department before starting my own solvent recycling company in 1961. Since then I have earned a law degree at the University of Maryland. Not all of them have law degrees; some of them do. I have been admitted to practice in Maryland.

Today I am representing the National Association of Solvent recyclers. That is a nationwide association of about 50 recycling companies and the only organization representing the solvent recycling industry. I am the vice president of that organization.

I have already submitted a wide-ranging statement to your committee. If you have any questions about it now or any matter that is not discussed there, I would be happy to answer them. I have the feeling, though, you want me to proceed and we can take those up at the end.

I would like to summarize by reading two sections of my statement, one that is commencing on page 11 regarding the unique role of the independent solvent recycling industry I represent. The second will begin on page 4 regarding recycling economics. I then would like to go directly to the recommendations we hope you will consider.

Would it be all right to proceed in that way?

Mr. GORE. Fine.

Mr. MRAZ. The first section I would like to read has to do with the unique role of solvent recyclers.

The independent solvent recycler's role is unique in the resource recovery sphere of waste management. This is because he performs two major functions; namely, reclamation and recycling.

Reclamation is the art of extracting the desired refined solvents from the waste crude material by processing it through a sequence of chemical unit operations programed to produce material at the desired specifications while maximizing yield and minimizing the volume and undesirable characteristics of the waste.

Recycling, the very important other function, is the art of placing the reclaimed solvent back into the stream of commerce where it best fits on the basis of volume, specification and price. The very key to the success of the reclamation-recycling effort is segregating the spent waste solvents in order to minimize the number and type of contaminants and processing the segregated waste through that particular equipment that will produce the precise purity of solvent necessary to reintroduce it into the particular use for which there is a demand. Only the independent solvent recycling industry has fulfilled this function in the past, and only that particular industry is positioned to do so now.

The bulk waste disposal industry is not well-suited to do it. They are generalists. They are geared to handle bulk quantities of material classified simply as flammable solids or liquids, nonflammable solids or liquids, or contaminated water. Were they to attempt reclamation with this philosophy they would, of necessity, place their waste organic liquids in large tanks with labels like alcohol, or ketones, or thinner, or chlorinated solvents.

There is an overpowering urge in our industry, in the bulk waste management industry, there is always the overpowering urge to combine materials and run long, long recovery campaigns.

Even if they were to refine their segregation to tanks containing words like isopropyl alcohol or methyl ethyl ketone, these tanks would contain the sum total impurities from all the different generators whose solvents were collected in that tank.

Eventually this bulk waste facility operator would wind up with a 1 million gallon tank of recovered MEK, methyl ethyl ketone, that would contain everyone's impurities but unsuited to reintroduction into anyone's process stream.

Even though the material would be reclaimed, it would not be at a purity or volume level that would allow it to be recycled. There

simply is no substitute for treating each waste stream as a separate personality.

Although the concept of resource conservation and recovery via recycling is popularly diagrammed as a bold, thick arrow leading from the waste generator back to the producer of the virgin goods, in the real world the recycling arrow is actually a blizzard of individual streams coming from countless manufacturing processes, flowing to a myriad of specialized independent solvent recyclers.

Individual reclaimed products tailored to meet specific requirements flow from the recycler back to numerous other producers of solvent and manufacturers, and individual waste residues also flow from the recycler to selected modes of disposal through the waste disposal industry.

The independent spent solvent recycler can operate very efficiently in this complex waste solvent flow network. Surprisingly, the generator of the waste material is not suited to do it for several reasons.

First, he is dedicated to manufacture of a finite number of products through narrowly defined production techniques. If recycle of a spent solvent of uniform composition coming from his manufacturing process is essential to the economic viability of his product mix—I think of DMF, for example, in the production of orlon—he may incorporate the recycling step directly in his process. This has always been done in the chemical industry. In that sense, recycling is nothing new.

If the spent solvent stream varies in composition, contains impurities that render it unsuitable for reintroduction into this process, is too small in volume for his scale of operation or is short lived, then he must rely on the independent solvent recycling industry to provide the technological flexibility he lacks, the standby recovery he cannot justify, and the special marketing skills to identify the precise need in other's manufacturing processes.

The other material is on page 4 and is a brief review of recycling economics.

I have described before that a large part of hazardous waste is liquid organic chemicals. Liquid organic chemicals tend to be solvents. Consequently, we call ourselves solvent recyclers. We handle the bulk of the liquid organic chemicals that are involved in hazardous waste today.

The relative importance of recycling as compared with disposal is obvious in the case of these liquid organic chemicals, or solvents. A drum of solvent-bearing lacquer residue—that is the drum you tend to see in these gruesome pictures of landfills that have been unsatisfactorily dealt with—costs approximately $100 to dispose of today in a landfill may contain as much as 45 gallons of solvent.

This solvent, in its refined form, is worth about $90 at new price. Since the typical cost of reclaiming a gallon of such solvent in sufficient purity to reintroduce it into the lacquer formulation is about $1 per gallon, the net savings to the generator of the waste drum is about $145 if he recycles the drum of material rather than disposing of it to a landfill. If the drum contained cheaper solvents, he might only save $120 per drum. If it contained less solvents, the savings figure might only be $100 to $110 per drum.

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The value of the solvent returned to the generator almost always exceeds the charge for recovering it, even where the recovery charge includes the cost of disposal of the residual waste, now significantly reduced in volume and often solidified for easier handling. But even in the worst case, where the value of the recovered solvent is less than the cost of recovery, the generator can avoid the full cost of waste disposal.

It goes on. At one point I see the waste material derives from the pharmaceutical or electronic industries. I was going to mention that these waste materials also derive from pharmaceutical, electronic, metal treating, the chemical industry, the electronic industry, a great volume comes from there, and I have just learned this morning it comes from the jewelry industry. So, I think it is safe to say that hazardous waste emanates from all industry. There is none that does not in some part of its manufacturing generate some of the hazardous waste.

The rest of the section on recycling economics goes on into other cases. I will leave that to your reading and at this point get to some of the recommendations we have, starting on page 15, that we think would assist in the management of hazardous waste in the country.

In describing the special and unique role played by the independent solvent recyclers in the resource conservation and recovery field, it becomes apparent that certain roadblocks exist which tend to thwart their ability to reclaim and recycle waste solvent streams. In addition, there are opportunities for the government to assist in the more rapid development of this vital new industry. Some of these are considered below.

First, we should limit to incineration and landfill. It is easier for generators of waste solvent streams to relegate them to disposal by incineration or landfill rather than deal with recycled solvent purity levels, segregated finished product storage, and improved waste segregation, storage and handling.

If the extra costs associated with direct disposal by destruction can be assigned to the generator's product selling price, the decision to dispose rather than recycle becomes even easier.

In the case of larger companies who fear unfavorable publicity and increased liability should their waste be mismanaged, the decision is easier yet. They will always try to dispose of the material by incineration. For many of the industries, the cost of the solvent is really not that important a part of their unit manufacturing costs, so they just avoid this possible liability by destroying the material.

Such destruction of these valuable recyclable resources on a mass scale should be stopped. A large part of hazardous waste, especially waste solvents, is a valuable resource. What appears to be a costly problem can become an economic opportunity through recycling.

Either limits should be placed on what materials can be destroyed by incineration or landfill by regulatory procedures or incentives should be created to encourage all generators to opt for the reclamation and recycling alternative.

An example of a limiting regulation would be a requirement that the generator complete an economic impact statement for each waste stream he proposes to destroy, providing justification for his

decision supported by quotations from one or more firms qualified to perform reclamation and recycling in a RCRA-permitted facility.

An incentive may take the form of a credit on the waste generator's taxes or an abatement of a manufacturing restriction that is proportional to the volume of material he successfully manages through the reclaim and recycle route. In addition, favorable publicity from appropriate Government agencies regarding generators who recycle could be helpful.

Another area is segregation. The key to all successful resource recovery is segregation, segregation, segregation. This is especially true for solvent streams. Segregation must begin at the point of generation and carry through all phases of the waste management cycle.

Too often, however, through long-standing sloppy practices or because waste material is still thought of as garbage, waste streams are combined into one container at the generator's facility rather than strictly segregated by type. Separating waste liquids that have been carelessly mixed into their pure or useful fractions can become enormously difficult and expensive. Sometimes it is impossible.

Regulations governing the storage of hazardous wastes should be modified to require that strict segregation be practiced by the generator. Only the impact of an enforced regulation can accomplish this task. Years of cajoling and educating the generators as to the economic benefits of strict segregation have not borne fruit.

The next section refers to reverse distribution. Many of the rusty drums that appear now in small bunches in woods and ravines originated with small generators who accumulated one to five drums per month of spent paint and lacquer residues, cleaning compounds, or metal degreasing solvents and then disposed of them through the local trash hauler. Their wastes are the most difficult to bring back into the mainstream of the resource recovery network because the quantities are small, because the wastes are inaccessible or in remote locations, or because they are variable in composition.

According to the present RCRA regulations, responsibility for the waste commences with the generator, the individual or business entity who first mixed together the different pure materials from which the wastes result. In the case of small generators, responsibility should commence with the distributor who sells and delivers the small lots to him.

The distributor is uniquely equipped to know where the material goes, the quantities involved, the formulations and specifications required, and usually the uses to which the materials are put.

Typically the distributor maintains sophisticated data processing systems involving detailed and accessible records regarding his numerous customers. He usually operates warehouses and trucks equipped with loading and unloading devices appropriate to the small lots he distributes.

He operates modern laboratory facilities through which he monitors the quality of his incoming pure materials and exercise quality control over his outgoing formulations. He provides technical assistance to his customers and, in turn, receives technical assistance from the large producers of the chemicals he distributes.

In short, he is beautifully positioned to assist in that part of the recycling network involving pickup of the waste materials and returning the recovered components to meet his customers' needs.

He would need, of course, to rely on use of an independent solvent recycling concern to handle the classified wastes and prepare them in the form necessary to reintroduce to the stream, but he is the guy who is in a great position to do this.

Incidentally, some distributors have already adopted this enlightened approach and advertise it as an additional service to their customers. The increase in business volume they receive, plus the additional revenue they generate by providing these services, more than compensates for lost sales of virgin solvents to replace material that is landfilled, incinerated, or otherwise lost. They should be encouraged and supported in this effort.

These distributors operate at some risk to their credibility with the customers. Where a distributor of virgin materials is seen to be managing a waste resource and recovery program involving recycling, there is always the suspicion that recovered materials are being blended with his virgin materials. This should not be a concern, but it is.

With today's more sophisticated reclamation techniques the recovered solvents are often purer than the virgin goods. Nevertheless, it would be desirable to eliminate this burden the enlightened distributor must bear by requiring all distributors to assume waste management responsibility toward the small generators they serve.

We go on to say as to existing RCRA standards, we believe they are good, they are excellent, they have given impetus to the upgrading of facilities and processing techniques throughout our industry. They have caused pain at times, but we applaud them. We are prepared to assist in any way possible toward refining them, if we are requested to do so.

We do have some problem with the State system of manifesting whereby shipping across three State lines causes a tremendous blizzard of manifest papers. We are really very much hoping that the Federal manifest system, wherein there is one uniform manifest used for crossing State lines, can be moved ahead on the calendar and gotten into place as soon as possible.

I talked there about siting of reclamation facilities. It has already been discussed in the panel. Obviously one facility like ours, operating from the mid-Atlantic seaboard, can serve New England. There is a mistake in my statement. I intended Southeastern States. We don't go to the Southwestern States.

Transportation costs are bound to be higher, but in the high return that one gets for this type of work, that isn't of itself dispositive. Really, what is the point in hauling these materials any farther than necessary and exposing greater numbers of the population and more of our environment to them, should an accident occur during transport. It doesn't make sense.

Consequently, we really wish the Federal Government would assist the States and local subdivisions in making rational, educated decisions in these siting matters by stressing the important role played by members of the waste management industry.

By stressing the processing of these materials under current RCRA standards is a conventional and technological sophisticated

thing posing no more neighborhood hazard than any other properly operated manufacturing facility.

As to this financial assistance, earlier in this paper I point out that we in the recycling industry, members—and this might be a figure interesting to you—the combined capacity of the NASR companies, the association, is 100 million gallons a year. Their capability is that right now.

There are 50 of us, the major ones, that belong to the association. We understand there are a few over 100 actual people in this solvent recycling in America today. The other 50 I think are fairly small and just in the beginning stages, so I wouldn't expect that figure to be much higher than 100 million. That is something for your consideration.

In turn, we are seeing less than 10 percent of the waste solvents that ought to be recycled. We have estimates that it exceeds 1 billion gallons, and we are only doing 100 million of that. Consequently, we are mentally equipped to do this, and we are technologically equipped.

We all began as small companies. By the very nature of the work we do, this expansion is expensive. We need special consideration, we believe, from SBA for new equipment, new machinery and new working capital to finance this.

All we are asking is special consideration, and this could take the form by more liberal subordination of their liens to the liens of the lending institutions. The lending institutions don't understand us as well as we would like. Consequently, they need some support from agencies such as SBA.

Thank you for the additional investment credit presently allowed for machinery and equipment. It is very helpful and should be retained, as is the tax credit granted for research and development in this field.

I had to hurry. I am sorry I took so long. Thank you.

[The prepared statement of Mr. Mraz follows:]

Recycling and Resource Reclamation
The Preferred Alternative To Disposal

Presented By

Paul J. Mraz, President

Spectron, Inc.
Elkton, MD

May 4, 1983

Before The

Subcommittee on Investigations and Oversight
Of The
U.S. House Of Representatives
Committee On Science And Technology

Rayburn House Office Building
Washington, DC

Testimony Given On Behalf Of The

National Association Of Solvent Recyclers
300 Arcade Square
Dayton, Ohio 45402

Synopsis

The origins of the independent solvent recycling industry are revealed. Economic advantages of recycling are given for various cases. Recyclers' unique ability to fit recycled material into the recycle network is explained. Recommendations for new policies encouraging the growth of recycling as an industry are listed.

Recycling - The Preferred Alternative

May it please the Committee my name is Paul Mraz. I am President and Chief Engineer of Spectron, Inc. a solvent recycling company with plant facilities in Elkton, MD and sales offices in Ossining, New York. Other details of my backround have been included with a written statement to the Committee.

I am appearing before you today as representative of the National Association of Solvent Recyclers, a nationwide organization of approximately 50 independent companies whose primary business is the reclamation of pure solvents from waste liquid streams and the recycling of these refined materials for industrial use.

Purpose

My purpose today is twofold. I want to tell you about the important and unique role members of our organization and other recyclers like us play in meeting the challenge of hazardous waste management through reclamation and recycle.

I also want to provide you with some suggestions for action whereby you can encourage growth and technological development in this important area.

Origin of the Independent Recycling Industry

A decade ago in a world of cheap fossil fuels little, if any, concern was given to the disposal machanism, or ultimate

fate of the waste and by-product streams resulting from our manufacturing processes. Vast quantities of spent pickling liquor, spent plating solutions, spent solvents from the paint and lacquer industry, spent liquid and vapor degreasing compounds, mixed streams of organic chemicals, and spent cleaning fluids, - all those things listed now as Hazardous Waste under the RCRA regulations - simply disappeared into the ground, the streams, the ocean, and the air. Commencing in 1974 two significant changes occurred. On the one hand it became evident that such wastes were having a damaging effect on the environment because of the methods for waste disposal then in vogue. At the same time the purchased costs of most of the materials comprising these wastes began to rise at double or triple the rate of inflation because they were primarily derived from hydrocarbon sources - like petroleum.

With the advent of state and federal legislation providing new enforced standards for the proper disposal of waste in order to protect and rehabilitate the environment, the immediate emphasis was placed on developing more suitable means of disposal of these waste materials. The obvious methods of disposal that were available were digestion in aqueous treatment systems, total incineration, secure landfilling, deep well injection and controlled ocean dumping. In response to this challenge large national companies were formed through acquisition of regional waste handling companies; financial resources were assembled; large company

organizational efficiencies were imposed; and the job got done. Today we have available public and private sites where all imaginable hazardous wastes can be landfilled, incinerated, or otherwise disposed of - all in accordance with the new federal and state requirements. Because the facilities that have been built are capital intensive and expensive to operate and supervise, the cost to dispose of a 55 gallon drum of a spent solvent laden lacquer residue has risen from about $5.00 in 1973 to something like $100.00 today.

At the same time the major disposal concerns were organized another significant movement began. That was the arrival on the scene of independent solvent recyclers. There had been solvent recyclers before 1973 but they were few in number and processed by-product streams for larger chemical companies on a custom basis. One or two recovered paint solvents. The new recyclers studied the composition of waste materials destined for disposal and sought to unravel selected streams into their pure or nearly pure components in order to recover their value.

Almost all liquid organic chemicals exhibit solvent properties and are usually called organic solvents. In terms of tonnage volume and unit value this class of waste materials is easily the most important. The independent recyclers perform their reclamation processes on these materials exclusively. For this reason they call themselves solvent recyclers.

The National Association of Solvent Recyclers, NASR, whom I represent today is the only national organization representing the independent solvent recycling industry. NASR includes almost all the pioneering early solvent recycling firms and most of the new ones too. There is another group called the Association of Petroleum Re-refiners who represent an international membership of used oil re-refiners, reclaimers, collectors, and distributers of recycled used oil. Although lubricating oil is a liquid organic chemical, it is not included in the general class called solvents and this group's activities are not discussed here.

The estimated total processing capability of all members of the NASR combined is about 100 million gallons annually. This is probably less than 10% of the total organic solvent produced and not incorporated in finished products or otherwise accounted for in the United States today. These solvents are the dominant liquid processing materials in the pharmaceutical, paint and lacquer, electronic, automotive, chemical, and metals finishing industries. Their recovered value is enormous. In their waste form they are all considered hazardous under the RCRA definitions.

<u>Recycling Economics</u>

The relative importance of recycling as compared with disposal is obvious in the case of these liquid organic chemicals, or solvents. A drum of solvent-bearing lacquer

residue costs approximately $100 to dispose of today in a landfill may contain as much as 45 gallons of solvent. This solvent, in its refined form, is worth about $90.00 at new price. Since the typical cost of reclaiming a gallon of such solvent in suffieient purity to reintroduce it into the lacquer formulation is about $1.00 per gallon then the net savings to the generator of the waste drum is about $145.00 if he recycles the drum of material rather than disposing of it to a landfill. [$100.00 for waste disposal charge avoided + $90.00 new value - $45.00 reclamation charge]. If the drum contained cheaper solvents he might only save $120 per drum. If it contained less solvents the savings figure might only be $110 per drum. The value of the solvent returned to the generator almost always exceeds the charge for recovering it even where the recovery charge includes the cost of disposal of the residual waste, now significantly reduced in volume and solidified for easier handling. But even in the worst case where the value of the recovered solvent is less than the cost of recovery the generator can avoid the full cost of waste disposal.

The situation involving the drum of spent solvent containing lacquer residue involves simple recovery technology. If the waste material were a spent solvent waste from the pharmaceutical or electronic industry the returned solvent specifications would be much tighter and more sophisticated recycling technologies involving vacuum fractionation, azeotropic or extractive distillation or counter current

extraction, followed by drying in molecular seive apparatus could be required. As a result recovery costs can be double or even triple the $1.00 per gallon figure mentioned for the recovered lacquer solvent. Nevertheless, there is always a economic advantage to the generator to recover rather than dispose of the waste material.

One alternative often selected by generators who produce flammable waste material containing lacquer or paint solvents and lacquer resins is to direct the material to a user of non-conventional fuels who will typically burn the liquid in a retort in order to produce cement or light-weight aggregate used in making concrete building materials. In situations like this the generator can dispose of his waste for about 20¢ a gallon or about $10.00 per drum = about one tenth the cost of its disposal in drums in modern landfills. It is an illusion, however, to regard such disposal by incineration as attractive simply because the BTU energy value of the contained solvents is being utilized in a productive manner. In the absence of the waste solvent the incinerator can substitute powdered coal at a price which limits the value of the waste solvent to about 15¢ per gallon. Where the waste solvent is a lacquer residue with a high concentration of good solvents the solvent recycler can still offer an economic advantage of $55.00 per drum [$10.00 for waste disposal charge avoided + $90.00 new value - $45.00 cost of recovery] or about $1.00 per gallon over the cost

of destruction through commercial incineration.

In yet another scenario it may be the solvent recycler, not the waste generator, who resorts to incineration of his residual lacquer residues after recovery of the contained valuable solvents. Even here the economics of recovery over incineration will soon prevail. To understand why, it is necessary to become familiar with the basic solvent recovery process performed on lacquer residues. Paint and lacquer residues from the coatings industry may contain 90 percent by volume of a blend of solvents and 10 percent by volume non-volátile resins, pigments, and polymers. They contain heavy metals too. When the solvent is recovered in wiped film distillation equipment a viscous bottoms material is expressed out the bottom of the machine and collected in tanks or drums awaiting waste disposal. Since it is composed of one part non volatile material and two parts residual solvent it constitutes 30% by volume of the orginal waste solvent residue. This bottoms materials has a high BTU value and seemingly is no good for any purpose but to provide heat energy in a cement or light weight aggregate rotary kiln. (If it contains any halogenated solvents it is not satisfactory for burning in a retort and must be disposed of in a landfill). Currently incineration in a rotary kiln is the disposal method selected. To the credit of the members of our independent solvent recycling association several companies are developing new techniques designed to

win the last solvent from this bottoms material, reducing the waste volume by a factor of three and increasing the recovered solvent yield to nearly 100% of that contained. Some propose to do this by high temperature processes. Others are experimenting with open steam distillation of the macerated polymeric residues. We at Spectron have pioneered in the adaptation of double drum dryer processing technology to this challenging problem. We have invested one half million dollars in this project with startup expected in about three weeks. Where the recovered solvents have a value of $2.00 per gallon compared to their waste liability of 20¢ per gallon the economics again must favor recovery over incineration.

Surprisingly in some situations where the waste solvent has low BTU energy recovery value rendering it unsuitable for the commercial incineration applications just described or where it requires substantial costs to incinerate and yet has substantial value as a recovered solvent the generator will opt to incinerate the material anyhow. This preference for expensive incineration over useful recovery raises a problem confronted by the generators and the early independent solvent recyclers as described in the next section.

History of Solvent Recycling

Because of the extreme variability of the waste solvent streams that required reclamation in the past, as well as today, solvent recyclers have always had to be flexible in

their operating procedures and have had to provide enough excess processing equipment to be versatile enough to handle each kind of stream. Research and development frequently had to be done on short notice. These are not operating characteristics that appeal to large companies. Consequently the early recycler was usually a small businessman and an entrepreneurial type. His was often a "Mom and Pop" operation. These solvent recyclers served as collection depots for large quantities of drummed and bulked waste solvent. Their financial resources and recovery charges allowed no room for concrete containment dikes or for enclosed storage buildings. There were no legal requirements to provide them. Often their inventory and accounting techniques were in their heads. Materials lost their identity and the containers rusted and leaked. Groundwater became contaminated. When the early landfills were suddenly closed these recyclers/ were left with the decaying drums on their property and no place to dispose of them. What had begun as yesterday's noble attempt to reclaim valuable solvents from spent waste became today's newspaper headline and a RCRA violation. Of the sixty-one cases brought into Federal Court from 1980 to 1982 under Section 7003 of RCRA, the section which provides relief against imminent and substantial endangerment of life and the environemnt, about one-third of the claims were brought against solvent recyclers.

The solvent recycler was an easy target. Unlike others

he was not hiding anything, Instead he was trying to solve a problem. The generators, especially large companies, were embarrassed by the discovery that drums of hazardous spent solvents which they had paid to have removed in a responsible manner were left in a crumbling condition on a solvent recycler's plant site, in an unproperly designed landfill, or simply just abandoned in a vacant lot or warehouse. These generators were also hurt financially by the cost of cleanup and retrieval. It is easy to understand, given this experience, why a generator would vow to incinerate all wastes in the future in order to leave nothing that could embarrass him again. The danger is that he would be allowed to do so even in a regulatory environment where the old conditions no longer obtain and where the material he seeks to destroy are valuable as society's resources and derived from irreplaceable fossil sources of hydrocarbon such as petroleum and coal.

Today the independent solvent recycler is no longer an unsophisticated organization. Thanks to state and federal regulations governing methods for operation of hazardous waste treatment and storage facilities recyclers' manufacturing plants are rapidly coming into structural and procedural compliance. Their methods and equipment are more sophisticated and capable of performing more complex recovery over a wider range of waste solvent streams. Today the solvent recycler not only has brought his own operations into compliance, but he also serves as an advisor to current and

would be waste generators advising them of proper storage, transportation, and documenting requirements under the RCRA regulations.

NASR, the National Association of Solvent Recyclers, provides assistance to the expanding new solvent recycling industry by 1) encouraging broader participation by all recycling companies, 2) upgrading the technical proficiency of the member companies through technical seminars at semi-annual meetings, 3) imposing ethical and manufacturing standards on the members' business conduct, and 4) educating the public in their areas of concern regarding the handling of waste materials.

The Unique Role of Solvent Recyclers

At the beginning I said that the independent solvent recycler's role is unique in the resource recovery sphere of waste management. This is because he performs two major functions - namely, reclamation and recycling. Reclamation is the art of extracting the desired refined solvents from the waste crude material by processing it through a sequence of chemical unit operations programmed to produce material at the desired specifications while maximizing yield and minimizing the volume and undesireable characteristics of the waste. Recycling, the very important other function, is the art of placing the reclaimed solvent back into the stream of commerce where it best fits on the basis of volume, specification, and price. The very key to the success of the

reclamation-recycling effort is segregating the spent waste solvents in order to minimize the number and type of contaminants, and processing the segregated waste through that particular equipment that will produce the precise purity of solvent necessary to reintroduce it into the particualr use for which there is a demand. Only the independent solvent recycling industry has fulfilled this function in the past and is positioned to do so now.

The bulk waste disposal industry is not well-suited to do it. They are generalists. They are geared to handle bulk quantities of material classified simply as flammable solids or liquids, non-flammable solids or liquids, or contaminated water. Were they to attempt reclamation they would of necessity place their waste organic liquids in large tanks with labels like "alcohol", or "ketones", or "thinner", or "chlorinated solvents". There is an overpowering urge to combine materials and run long recovery campaigns. Even if they were to refine their segregation to tanks containing single chemical species as "isopropyl alcohol" or "methyl ethyl ketone" these tanks would contain the sum total impurities from all the different generators whose solvents were collected.

Eventually the bulk waste facility operator would wind up with a million gallon tank of recovered MEK containing everyone's impurities but unsuited to reintroduction into anyone's process stream. Even though the material

would be reclaimed it would not be at a purity or volume level that would allow it to be recycled. There simply is no substitute for treating each waste stream as a separate personality.

Although the concept of resource conservation and recovery via recycling is popularly diagrammed as a bold thick arrow leading from the waste generator back to the producer of the virgin goods, in the real world the recycling arrow is actually a blizzard of individual streams coming from countless manufacturing processes, flowing to a myriad of specialized independent solvent recyclers. Individual reclaimed products tailored to meet specific requirements flow from the recycler back to numerous other producers of solvent and manufacturers. And individual waste residues also flow from the recycler to selected modes of disposal through the waste disposal industry.

The independent spent solvent recycler can operate efficiently in this complex waste solvent flow network. Surprisingly the generator of the waste material is not suited to do it for several reasons. First he is dedicated to manufacture of a finite number of products through narrowly defined production techinques. If recycle of a spent solvent of uniform composition coming from his manufacturing process is essential to the economic viability of his product mix he may incorporate the recycling step directly in his process. This has always been done in the chemical industry.

If, however, the spent solvent stream varies in composition, contains impurities that render it unsuitable for reintroduction into this process, is too small in volume for his scale of operation or is short lived, then he must rely on the independent solvent recycling industry to provide the technological flexibility he lacks, the standby recovery equipment he cannot justify, and the special marketing skills to identify the precise need in other's manufacturing processes.

The Small Generator Problem

The discussion to this point has dealt with bulk quantities of waste solvent streams - ie. volumes of 5000 gallons or more. However, the largest number of generators accumulate waste solvents in much smaller quantities, eg. 1 to 10 drums in a batch. This/poses significant transport and processing problems for the independent solvent recycler. Assuming the generator agrees to ship the drums to the recycler or the recycler dispatches a truck to pick up these drums (at high freight cost in either case) the recycler is posed with a problem of identification, variability, and insufficient batch volume at his process facility. Often the generator decides to ship the drums directly to a waste disposal facility father than be concerned with the complexities of recycling such small quantities. Too often the recycler to avoid a headache does nothing to discourage the generator's decision to dispose even when valuable solvents are involved because of the variability and low volume. It would be

easier for the chemical distributor, who sold the virgin goods to the generator and delivered them, to pick up the waste drums of material during a subsequent delivery, and return the waste material to his warehouse - a sort of distribution in reverse. The distributor could analyze the returned waste, classify it, and store it in those narrow groupings representing the virgin formulation the generator had received. When enough waste material has assembled the independent solvent recycler would be expected to pick it up at the distributor's warehouse, process it at his recycling facility, and return it to the distributor to be brought to match the original formulation for reuse by the same customer.

Recommendations For New Policies In The Field of Waste Management

In describing the special and unique role played by the independent solvent recyclers in the resource conservation and recovery field it becomes apparent that certain roadblocks exist which tend to thwart their ability to reclaim and recycle waste solvent streams. In additionthere are opportunities for the government to assist in the more rapid development of this vital new industry. Some of these are considered below.

Limits to Incineration and Landfill:

It is easier for generators of waste solvent streams to relegate them to disposal by incineration or landfill rather

than deal with recycled solvent purity levels, segregated finished product storage, and improved waste segregation, storage, and handling. If the extra costs associated with direct disposal by destruction can be assigned to the generator's product selling price the decision to dispose rather than recycle becomes even easier. In the case of larger companies who fear unfavorable publicity and increased liability should their waste be mis-managed the decision is easier yet. They will try to dispose of the material by incineration.

Such destruction of these valuable recycleable resources on a mass scale should be stopped. A large part of hazardous waste, especially waste solvents, is a valuable resource. What appears to be a costly problem can become an economic opportunity through recycling.

Either limits should be placed on what materials can be destroyed by incineration or landfill by regulatory procedures, or incentives should be created to encourage all generators to opt for the reclamation and recycling alternative.

An example of a limiting regulation would be a requirement that the generator complete an economic impact statement for each waste stream he proposes to destroy, providing justification for his decision supported by quotations from one or more firms qualified to perform reclamation and recycling in a RCRA permitted facility. An incentive may

take the form of a credit on the waste generator's taxes or an abatement of a manufacturing restriction that is proportional to the volume of material he successfully manages through the reclaim and recycle route. In addition, favorable publicity from appropriate government agencies regarding generators who recycle could be helpful.

Segregation:

The key to all successful resource recovery is segregation. This is especially true for solvent streams. Segregation must begin at the point of generation and carry through all phases of the waste management cycle. Too often, however, through long standing sloppy practices or because waste material is still thought of as garbage, waste streams are combined into one container at the generator's facility rather than strictly segregated by type. Separating waste liquids that have been carelessly mixed into their pure or useful fractions can become enormously difficult and expensive. Sometimes it is impossible.

Regulations governing the storage of hazardous wastes should be modified to require that strict segregation be practiced by the generator. Only the impact of an enforced regulation can accomplish this task. Years of cajoling and educating the generators as to the economic benefits of strict segregation have not borne fruit.

Reverse Distribution:

Many of the rusty drums that appear now in small bunches in woods and ravines originated with small generators who

accumulated one to five drums per month of spent paint and lacquer residues, cleaning compounds, or metal degreasing solvents and then disposed of them through the local trash hauler. Their wastes are the most difficult to bring back into the mainstream of the resource recovery network because the quantities are small , because the wastes are inaccessible or in remote locations, or because they are variable in composition. According to the present RCRA regulations responsibility for the waste commences with the generator, the individual or business entity who first mixed together the different pure materials from which the wastes result. In the case of small generators responsibility should commence with the distributor who sells and delivers the small lots to him.

The distributor is uniquely equipped to know where the material goes, the quantities involved, the formulations and specifications required, and usually the uses to which the materials are put. Typically the distributor maintains sophisticated data processing systems involving detailed and accessible records regarding his numerous customers. He ususlly operates warehouses and a fleet of transport vehicles equipped with loading and unloading devices appropriate to the small lots he distributes. He operates modern laboratory facilities through which he monitors the quality of his incoming pure materials and exercises quality control over his outgoing formulations. He provides technical assistance to his customers and, in turn,

receives technical assistance from the large producers of the chemicals he distributes. In short he is beautifully positioned to assist in that part of the recycling network involving pickup of the waste materials and returning the recovered components to meet his customers' needs.

The distributor should be required to retrieve the waste materials derived from the virgin materials he sells and store and classify them. He should be required to either establish recycled product quality specifications and arrange to reclaim the material to those specifications through an appropriate independent solvent recycling facility or he should make the classified waste material available for resale - to the recycled solvent market, for example.

Some distributors have already adopted this enlightened approach and advertize it as an additional service to their customers. The increase in business volume they receive plus the additional revenue they generate by providing these services more than compensates for lost sales of virgin solvents to replace material that is landfilled, incinerated or otherwise lost. They should be encouraged and supported in this effort. These distributors operate at some risk to their credibility with their customers. Where a distributor of virgin materials is seen to be managing a waste resource and recovery program involving recycling there is always the suspicion that recovered materials are being blended with his virgin materials. This should not be a concern,

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but it is. With today's more sophisticated reclamation techniques the recovered solvents are often purer than the virgin goods. Nevertheless it would be desireable to eliminate this burden the enlightened distributor must bear by requiring all distributors to assume waste management responsibility toward the small generators they serve.

Existing RCRA Standards:

The existance of RCRA standards governing construction and operation of waste management facilities including those of our independent waste solvent recycling industry have been beneficial and should be enforced as written or currently proposed. These standards have given impetus to the upgrading of facilities and processing techniques throughout our industry, and although they have caused pain at times we applaud them and are prepared to assist in any way possible towards refining them if we are requested to do so.

We do encourage the imposition of a federal manifest system at the earliest opportunity to replace the confusing, and complex manifesting procedure imposed on interstate transport where each state has its own manifesting procedure.

Siting of Reclamation Facilities:

Reclamation facilities are most efficiently operated on a regional basis. Thus, although one facility operating from the mid-Atlantic seaboard can serve both New England and the Southwestern states, transportation costs are bound to be higher and could result in a justified decision to landfill or incinerate

rather than recover in an economic borderline case. In addition, there is no point in hauling these materials any farther than necessary and exposing greater numbers of the population and more of our environment to them should an accident occur during transport.

States have enacted siting laws some of which give a state siting board absolute power over local zoning boards for the location of waste management facilities. Some of these laws allow the local subdivision to retain this siting power. As a practical matter the decision always rests with the local subdivision, and it is probably good that it does.

We believe the federal government can assist the states and local subdivisions in making rational and educated decisions in these matters by programs stressing the important role played by members of the waste management industry involved with resource conservation and recovery, and by stressing that processing of these materials under current RCRA standards is a conventional and technologically sophisticated operation posing no more neighborhood hazard than any other properly operated manufacturing facility.

Financial Assistance:

Members of the independent solvent recycling industry started as small businesses operated by individuals who understood the complexity of handling each waste stream as a separate identity and were flexible and adroit enough to process the streams and reintroduce them into the commercial network. We have come a

long way in terms of technological sophistication, improvement in business and accounting systems, and in the range of processing techniques that we can bring to bear on these problems. Although our industry's capacity continues to expand we are only seeing less than 10% of the waste solvent streams that exist. If limits are placed on destruction of economically recoverable waste solvent streams through landfill or incineration then the recycling industry must be prepared to handle the increased volume of streams to be reclaimed and recycled. This will require expansion of our small businesses. We are prepared mentally and technologically to meet this challenge. However we will need understanding and assistance in financing such expansion.

Private lending institutions are not as familiar with this new industry as we would wish. Small Business Administration guarantees would be extremely helpful where a company seeks to expand by debt financing. We would ask SBA to give special consideration to applicants for loans involving machinery and equipment and working capital in these cases. Such special consideration could take the form of subordination of SBA liens to the lending institution's liens against the borrower's property where both SBA and a lending institution are providing the funds on a shared basis.

The additional investment credit presently allowed for machinery and equipment purchased to carry out solid waste recovery is very helpful and should be retained. This is also true of tax credits granted for new research and development in

this field.

Conclusion

Whoever said that every problem represents the other side of an opportunity was correct in this case. We feel that hazardous waste can be and is a valuable resource. What now appears as a costly problem can be turned into an economic opportunity.

Paul J. Mraz

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Nuclear Engineering - Maryland
Engineering - Ohio

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Eight children.

Born: Canton, Ohio

Age: 55

Mr. VOLKMER [presiding]. Does the gentlelady from Rhode Island have any questions?

Mrs. SCHNEIDER. Yes, I do.

The testimony that all of you have presented to us essentially says, if I might briefly summarize, that we have the technology available, that there is willingness to recycle, reuse, and reclaim some of our hazardous wastes, but as we look across the country we don't see it happening, as far as I am concerned, nearly fast enough.

A number of you have recommended a variety of different incentives or recommendations. Some of those recommendations relate specifically to the Federal Government. I think that in terms of us providing a tax break or whatever, we are constantly pressured with the problem of looking at—I just found out this morning Senator Baker is going to propose a budget to the Senate of $193 billion. We are reluctant to be tampering too much more with the revenue end of things.

Outside of that dollar at the end of the stick, instead of a carrot, if we put a ban on the landfills, that is like running down the same path we did before when we said, "Thou shalt not do any more ocean dumping," and we found that when they weren't dumping it in the ocean, they were putting it in the landfills.

I think, as you mentioned, Mr. Mraz, there are some options that we could encourage the SBA to provide the capital toward moving ahead more rapidly. What do you see as some of the other impediments and solutions toward a real surge in solving this problem?

Mr. MRAZ. First, Mrs. Schneider, I didn't suggest that we are in favor of an absolute ban on using of landfills. I only suggested that it be limited to the extent that economic impact or justification be supplied before it be landfilled. For example, we just hate to see these valuable materials that are really part of our natural resources going into landfills unnecessarily.

In all deference to the gentleman from CECOS International, there is a host of this hazardous waste that must be landfilled, by our understanding in the solvent recycling industry.

As to other roadblocks, I would say that we constantly run into the large company who wants to avoid appearing in a headline because his materials are possibly going to be mismanaged regardless of where they go, whether it be in the landfill, whether it be to a solvent waste recycling facility.

The trend today is to incinerate, turn it into carbon dioxide and water. He is the guy who needs to be reassured, I guess, by the realization—not necessarily through the Government, I guess it is part of our educational problem, too, to let him know this—that today's solvent recycler is not yesterday's solvent recycler.

We have made great advances. We are a respectable member of the community and we all operate under RCRA regs. Those bad old days are behind us.

Mrs. SCHNEIDER. Mrs. DeClemente, I wonder if you could give us a little insight. When you talk to your competitors or coworkers in the jewelry industry, why aren't more of the jewelry manufacturers, for example, moving toward this type of waste treatment that you are doing?

Mrs. DeClemente. I think one of the factors is cost. Remember, we were going into a brandnew building. It is somewhat not as expensive to start out as scratch and build it in as it is now to be within your facility and to have to adapt your current plating situation to a waste treatment system. It becomes a little bit more expensive.

What we have found is that we are saving now, really making up for it. I really believe in the Providence method.

Mrs. Schneider. During what time period have you realized this profit?

Mrs. DeClemente. It has been 2 years now. This is our third year and, as I said, we are expanding. It really has made a big difference—not whether Mr. Hittinger was here or not—in the quality of our plating, on the feeling that we have that we are not polluting.

We constantly keep in contact with Thibault to make sure if there is anything else that has come up that we should change around. We are currently going to be doing some things this July during our closing period.

We do feel responsible. There are some things which I did not mention. There are some alternatives. I mentioned to Mr. Hittinger a while ago that maybe we should think about alternatives—I know in the jewelry industry—of products that you can use other than those that are generating to be hazardous.

We have turned some of our products where there is for a bright dipping process that we have after goldsmithing or soldering, which is highly explosive and really not good at all to handle. We have gone into a substance where everything we use in our facility that involves water for processing is done with this Providence method system.

It takes longer to use this particular substance; it is not hazardous in any way, shape, or form, but it takes longer and it costs more money. But the end result is a better product. There is no shortcut.

Mrs. Schneider. Then you can translate your cost into a higher cost on the product because you are selling a quality item?

Mrs. DeClemente. Right. The jewelry industry in Rhode Island has been kind of "you know," and everyone says to me, "What are you doing, Ubio, that is different?"

My husband and I, when we started the business 12 years ago, said we will do nothing but quality, and this was our cup of tea, and we are busy.

Mrs. Schneider. Regrettably, everybody doesn't share those high standards that you have. Otherwise, we wouldn't be having this hearing today.

What you are suggesting is going beyond the source reduction, which Mr. Mraz is speaking about, and you are also recommending in your original materials that you are using that you are looking toward alternatives.

What I am curious about is where you find out about those alternative materials. Is there a supplier or is this the distributor that Mr. Mraz was referring to?

Mrs. DeClemente. It is distributors of various chemical suppliers that we do business with, and also Mr. Hittinger. We try to connect with everything to get our information.

I know for the industry—and I probably shouldn't say this—the manufacturers of jewelry don't always come out with a new product update as to what is being used that could be an alternative.

We do pay attention when they come in with a fact sheet as to what is the hazardous result with the particular product. I am not for changing product for a product. I am very concerned with what the outcome will be with this product.

Mrs. Schneider. So one of the impediments we have identified this morning is the whole economics, the cost, the capital, but it is a problem that can be overcome.

Mrs. DeClemente. It can. Ours was the capital, too, but we did it and I can say right now that I am happy we did it.

Mrs. Schneider. It was financially worth it.

The other problem is one of information. To what degree do you find there just isn't information out there for manufacturers, or has the NRDC conducted some studies saying that when people have the knowledge of technological alternatives, they are pursuing them? To what degree is there an information gap? Any of the panelists can feel free to answer.

Mrs. DeClemente. I find that myself to a large degree, but you go ahead, Mr. Hittinger.

Mr. Hittinger. If I may, there is an awareness problem as well as the informational problem. Some of the information does exist in the hands of the suppliers and in the hands of some of the more modern techniques, such as the Providence method, but it is just that the individuals who could use it are not aware that it exists and what the benefits could be to them. It is difficult to see how to solve that awareness problem.

Mrs. Schneider. Perhaps the industry itself, whether it be the chemical industry that has numerous magazines and newsletters, or the Jewelry Manufactures Institute, that could perhaps be the vehicle. I don't know.

Ms. Bloom, did you want to add something?

Ms. Bloom. I wanted to add that that statement seems to be borne out by New York's experience. I spoke with the director of the waste exchange that works with New York, and also to the director of their Environmental Facilities Corp.

They found in dealing with industry one of the biggest problems that they encountered was simply a lack of knowledge of what substitutes could be used and how the process could be modified, but also how to obtain recycled materials and what they had that was valuable that someone else might want, which is why the State attempted, with very limited funding, to put together a preliminary handbook on what materials were available and who had them.

There are problems involved with that involving confidentiality, for one. Companies are reluctant, sometimes for fear that confidential processes will be revealed, to share that information. With even the very limited money that New York had to put that together, they came out with a useful document. If they had more money, they would have been able to come out with a much more complete one.

Mrs. SCHNEIDER. Is this program that you are referring to the waste exchange program? Is that what it is called?

Ms. BLOOM. New York's program is industrial materials recycling program, which is mandated by the Industrial Materials Recycling Act. It is a statutorily mandated program that is administered by a public authority, a kind of quasi public-private corporation called the Environmental Facilities Corp.

It was given a small EPA grant—I am not sure whether the grant originated in this administration or the last—to put together this handbook specifically.

Mr. GORE. If the gentlewoman would yield, we had testimony on waste exchange systems in the Tennessee hearing.

Mrs. SCHNEIDER. In my previous life I was familiar with a toll-free number that was called Waste Alert. I used to refer people to that number. I cannot find it now, I don't know if it currently exists, but I am looking for it.

Did that come forward in the testimony, too, Mr. Gore?

Mr. GORE. No.

Mrs. SCHNEIDER. It was a national toll-free number where any manufacturer could take his product, call in, and then have it picked up, exchanged. Have any witnesses heard of that?

Mr. MRAZ. Let me say that I am familiar with the waste exchange concept, or the Waste Alert concept. These things normally seem to originate in different States or regions. We do, in the solvent recycling industry, consult those lists and have come upon several valuable streams that deserve to be inspected for recycling.

Let me say one thing, Mrs. Schneider. I don't know that the generator is all that innocent about being unable to contact people who will help him with his problem. I have a customer of very many years, and that is as far as I will identify him, who has known for years that 30,000 pounds of MEK has gone into the air on a daily basis with full knowledge of the regulatory authorities. It was just a natural part of his production method.

The technology for recovering MEK from air has been well known for a long time. Those folks just sit there and wait for someone to force them to buy the necessary carbon-absorption equipment. They know who to call once they have recovered it in the carbon-reabsorption equipment. They knew to call us and take the distilled material, the way you recover it from the carbon-absorption equipment, separate it back into its pure components. They were just sitting by.

Mrs. SCHNEIDER. I can conclude by that remark that there are those who will not take the private initiative, such as Mrs. DeClemente, and therefore the U.S. Government should be more involved in enforcement of regulations to protect the public health? We will take a yes or no on that one.

Mr. MRAZ. Yes.

Mrs. SCHNEIDER. Mr. Chairman, I thank you for your indulgence. I have no further questions.

Mr. VOLKMER. I now recognize the gentleman from Tennessee, the chairman of the subcommittee.

Mr. GORE. Thank you.

I just have a couple of brief questions because we are running late.

Ms. Bloom, I should have known this, because I have had 40 hearings in different subcommittees on this problem, but I was still shocked to read in your statement on page 9 that:

The current underground injection control regulations under the SDWA expressly authorize injection directly into underground sources of drinking water. This practice is allowed to continue six months after state UIC programs have been approved by EPA, a process that is only now getting underway.

In other words, the Federal Government says that it is perfectly all right to take hazardous wastes and inject it underground, right into drinking water sources. Is that what you are saying?

Ms. BLOOM. Under the current regulations, until such time as 6 months after a State program is approved, it is allowed. In fact, there was a question under the original final UIC regs as to whether it was in the interim allowed. As a result of a settlement of litigation with the industry, EPA specifically clarified that a year ago and said yes, you can, until such time.

One of the problems is that EPA has not moved quickly to approve those programs. There was a statutory deadline which ran out for approving them, at which point either EPA had to implement its own program for the State or approve the State program. It has done neither in the majority of States, as you can see.

The extent of the problem—and I want to emphasize this—is really undercharacterized. EPA has very little data on exactly what is going on in each State. They simply haven't inventoried the wells. They had a contractor study done in 1979 that estimated there are between 5,000 and 10,000 class IV wells, which are those either directly injecting into aquifers or above, and they simply never followed up on it.

Some of the inventory data in some States shows zero. New Jersey claims that it has no underground injection into or above drinking water aquifers. New Jersey is certainly not a State in which land disposal is an unknown practice. New York estimates 185, and that is based on pulling together some stuff in their files. It has never been verified with field surveys.

So, we are dealing with a problem, the magnitude of which is not known, but from the little data that we have, it is of at least serious enough concern that EPA has to move quickly to ban those wells that are injecting into or above and to figure out where they are and take action promptly.

Mr. GORE. We are talking about alternatives to landfill disposal. I would think that if you were constructing a priority list according to how desirable the alternatives were, that injection of the hazardous wastes directly into the drinking water would be pretty far down the list on the desirability scale.

Ms. BLOOM. Some major industry members have specifically supported a ban. Du Pont supports a ban, as far as I know, on class IV injection. We are not talking here about class I injection, which is deep-well injection. I want to clarify that.

Mr. GORE. Of course, this practice is absolutely ridiculous. It should be stopped immediately.

Ms. BLOOM. I would agree.

Mr. GORE. Injection of hazardous wastes directly into drinking water is dumb. That ought to be prohibited right away. I don't understand why there is any disagreement about that.

Ms. BLOOM. Indeed, there should not be. I think that legislation in this session is absolutely essential to make it perfectly clear that this is not an authorized way of disposing of hazardous wastes, that our drinking water is simply too precious.

Mr. GORE. I think that Chairman Fuqua's bill would outlaw the practice 6 months after enactment, if I am not mistaken. We will reference that for the record.

Mr. Mraz, you indicate on page 17 of your testimony: "The key to all successful resource recovery is segregation." One of the real problems that we identified in the Jackson, Tenn., hearing was that a lot of generators will take all different kinds of wastes, mix it all together, and end up with a toxic soup that nobody can really treat, or recycle, or do anything with and dump it into landfills. It may contain lots of halogenated solvents that will eat a pathway in the landfill for the other materials that are mixed in with it.

Your point I think is a very important one and ought to be underscored; that is, if we are going to be successful in encouraging reduction at the source, recycling of hazardous wastes, we have to get this first step of keeping separate the different kinds of wastes that are generated so that they can be treated appropriately.

Mr. MRAZ. Absolutely.

Mr. GORE. Just to take a hypothetical example, if you have a company that is creating 1,000 pounds a day of relatively nontoxic wastes and 10 pounds a day of extremely toxic wastes, it makes little sense for them to mix it all together and come up with 1,010 pounds of highly toxic waste.

We focused in on the first panel on the very dangerous substances of PCB's and dioxins. They are much more difficult to handle if they are mixed in with all this other stuff. I just wanted to underscore this in my questions.

Mr. Chairman, in light of the time that is all I have at this point.

Mr. VOLKMER. I would like to ask Mr. Mraz, can you identify for us the type of companies that basically use the solvents or have them wastes?

Mr. MRAZ. I hurried through that. The chemical companies, of course, generate spent solvent streams. The coatings industry, the paint and lacquer industry generates an awful lot of these solvent-type wastes.

Another big surprise is the electronics industry, the people making electronic circuit boards, the large ones. They generate awesome amounts of solvent wastes. Pharmaceutical industries, people who tend to run campaigns on this kind of antibiotic and then that kind of antibiotic, each using different solvent streams, used to have a lot to dispose of. It still does. We do an awful lot of work with the pharmaceutical industry.

It goes on and on. Of course, the newspaper industry, from the printing inks, that is kind of like the coating compounds; the jewelry industry, as I said, we learned this morning. There is not one that doesn't, but some are big users.

Mr. VOLKMER. Those that are, do any of them recycle themselves?

Mr. MRAZ. Yes; you see, in my definition I called recycling the ability to recover the stuff and plug it right back into the commercial stream, so to speak. That is an old thing.

My experience in the chemical industry is that sometimes where the byproduct becomes the dominant economic consideration, you must, of necessity, include the recovery facility for that byproduct right with your plant or make very close arrangements with a recycling firm operating on a customer contract basis with you to do that.

So, yes, that has always been done, where the economics even in the old days were very obvious that that had to be done.

Mr. VOLKMER. The thought I was getting to is would it be feasible within statutory law to require those where it is economically feasible to do so, to require them to do so? Can you arrive at a formula whereby it can be determined whether it is economical, even though they may think that it isn't?

Mr. MRAZ. That is kind of what I am suggesting, I guess, that the valuable components be identified and not be disposed of to landfills and that that identification take the form of an economic impact statement.

That economic decision could involve them doing it themselves in those rare situations where it does now make sense, or it could involve a permitted independent solvent recycler handling the job for them. I do think that is an extremely practical approach.

Mr. VOLKMER. What is the largest distance that you transport solvents?

Mr. MRAZ. We go right now, because of the siting problem, primarily from Maryland to Burlington, Vt. We go about 300 to 350 miles from the plant in both directions.

Mr. VOLKMER. Is there any concern about having accidents? It is transported by truck, I suppose?

Mr. MRAZ. Absolutely. We are always concerned. We consider that one of the most vulnerable aspects of the job, but of course we operate under rather strict DOT requirements now that have upgraded the equipment that is on the road and the drivers who drive it. Knock on wood, we haven't had any of those problems in our company. It is certainly something to be concerned with. You always worry about this flammable material on the highway.

Mr. VOLKMER. It is toxic material?

Mr. MRAZ. Some of it is toxic.

Mr. VOLKMER. In my district we had a railroad accident in which a railroad car had a very small amount, a couple teaspoonsful, of dioxin in the whole railroad car. The railroad now has a judgment against it, around $45 million, from the people who worked to clean it up. So, this will give you some idea of the problems that are connected with it.

Mr. MRAZ. RCRA requirements are that waste-analysis certificates have to be provided on materials so that members of the solvent-recycling industry generally avoid like the plague those things that contain dioxins or PCB's and go to great lengths to make sure that they do not contaminate anything.

Mr. VOLKMER. Mrs. DeClemente, in the event that the process that you did finally utilize had not been as economical, and let's say it had not shown a positive side on the economy scale as far as reclaiming and processing, but had been a negative and had been a cost factor, would Ubio gone ahead with it, do you believe?

Mrs. DECLEMENTE. Yes.

Mr. VOLKMER. Rather than having the waste to dispose of?

Mrs. DECLEMENTE. Yes.

Mr. VOLKMER. Can you tell me why?

Mrs. DECLEMENTE. I think you would have to know me, and my husband, and our product, and our facility. I have very strong beliefs in that I think everything depends upon the individual in society. If we all ourselves try to help, we wouldn't all be sitting here. I would say that I would do this.

I may have looked further for incentives in terms of tax advantages or maybe even pushing more as far as a loan in terms of financing this particular situation. However, I would have gone through with it. It is needed.

Mr. VOLKMER. Thank you.

Does the gentleman from Illinois have any further questions?

Mr. DURBIN. No, Mr. Chairman.

Mr. VOLKMER. Mrs. Schneider.

Mrs. SCHNEIDER. No, thank you.

Mr. VOLKMER. I want to thank all of you for being here today. We appreciate your testimony tremendously. It will be a very big help in future deliberations in this committee and the Congress on what we need to do as far as processing of hazardous wastes.

Thank you very much.

Our third panel will involve themselves with approaches by the States to the problem of toxic waste disposal.

We will have Mr. Kent Stoddard, director of the toxic waste assessment program, the California Office of Appropriate Technology; Mr. Bob Kuykendall, manager, land pollution control division, Illinois Environmental Protection Agency; and Norman Nosenchuck, director of the division of solid waste, New York State Department of Environmental Conservation.

We will start with Mr. Stoddard. Your statement will be made a part of the record. You may proceed with the statement or summarize.

STATEMENTS OF S. KENT STODDARD, FORMER DIRECTOR, TOXIC WASTE ASSESSMENT PROGRAM, CALIFORNIA OFFICE OF APPROPRIATE TECHNOLOGY; ROBERT KUYKENDALL, MANAGER, LAND POLLUTION CONTROL DIVISION, ILLINOIS ENVIRONMENTAL PROTECTION AGENCY; AND NORMAN NOSENCHUCK, DIRECTOR, DIVISION OF SOLID WASTE, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Mr. STODDARD. I will try to summarize my testimony, Mr. Chairman.

I would like to start off by correcting the record. I was a former director of the toxic waste assessment program. The Office of Appropriate Technology no longer exists. Today I represent myself, not the State of California.

My name is Kent Stoddard. For 2½ years I directed California's program to phase out the land disposal of highly toxic wastes and to try to encourage the construction of new, advanced, waste management facilities throughout the State.

I appreciate the opportunity to testify here this morning about certainly one of the most serious public health and environmental

problems facing this Nation; that is, our continued reliance on the land for disposal of highly toxic wastes.

You have already heard a great deal of testimony concerning alternative technologies and how they can be used to safely reduce, recycle, treat, destroy many of the hazardous wastes that we now place in land disposal facilities.

I think it is now time that we change the emphasis of our current debate on land disposal versus alternative technologies. We have to accept that there is now overwhelming evidence that land disposal is inadequate for the long-term containment of hazardous wastes. We must also recognize that alternative technologies are feasible, they are affordable and they are far safer than land disposal practices.

The focus of the debate must now become what can we do to insure that these alternative technologies rapidly become the centerpiece of our national waste management strategy. There are many approaches that can be taken. I believe California's program offers sound evidence that the transition from land disposal to alternatives can be accomplished without disrupting the Nation's economy. It can be accomplished without causing any severe economic hardships on the thousands and thousands of generators throughout the country that now produce hazardous wastes.

I will try to briefly summarize the approach California has taken to restrict land disposal; very briefly describe a major study that we prepared a year ago; also describe how our new landfill ban works, it has now gone into effect; and finally discuss the effect that our program has had on California's business and industrial community.

Eighteen months ago California completed what was at that time the first and the most comprehensive study that had been done to date on alternatives to the land disposal of hazardous wastes.

That report offered a detailed characterization of how much and what type of wastes were produced in California. It identified those hazardous wastes, which also represented the most serious threat to human health and to the environment when they were placed in a land disposal facility.

At the time this report was completed, the conclusions of the study were startling to both the Governor and the Legislature of California. We found that almost 40 percent of the wastes that were going into our class I land disposal facilities were highly toxic and were very persistent.

These wastes were capable of causing death and serious human illness and also did not degrade for very long periods of time. We found those wastes were unquestionably inappropriate for land disposal.

We also found that it was technologically feasible to treat or destroy or recycle approximately 75 percent of all the wastes that were going into our landfills. That assessment was based only on our examination of known, well-proven, documented technologies. We looked at no exotic technologies, and came up with a number that 75 percent could be reduced, recycled, treated, or destroyed.

We also found that the additional cost of recycling or treatment would have a minimal effect on California industries and that

those additional costs were justified, given the serious risks to human health and to the environment.

Finally, we discovered that almost all the new waste management capacity that California would need to recycle and treat as hazardous wastes could be developed in less than 2 years.

After 1½ years of close scrutiny by the California Legislature and by California's chemical, petroleum, and electronics industries, these major conclusions are almost universally accepted today.

I have attached to my written testimony a list of over 30 organizations, companies, government agencies that are officially on record in California in support of prohibitions on land disposal.

Our report on landfill alternatives offered three key recommendations to the Governor and to the legislature as a means of drastically reducing the 4 million tons of hazardous wastes that we place in landfills each year in California. The recommendations were as follows:

First, California's regulatory agencies prohibit the land disposal of highly toxic and persistent wastes.

Two, we recommended that the State should impose higher fees on the land disposal of all hazardous wastes.

Finally, we recommended the State should encourage the construction of new alternative waste management facilities by streamlining the permit process and by providing financial incentives for investments in alternative technologies.

I point out the last recommendation, the financial incentives, has been a real bust. We haven't been able to do it. We haven't been able to get the legislation. It also appears that it is not particularly critical in moving the State away from land disposal and toward alternatives. A little later in my testimony I think far more compelling approaches come out that I think discount the need for any strong program of financial incentives.

The recommendations that we did put forward represented a very radical shift for the State of California, which in the past has been very reliant on land disposal. We have a good climate for land disposal, where precipitation is far less than evaporation, so we use a lot of surface impoundments.

In the past, the State was very aggressive in going out and permitting class I disposal sites. I think we probably had more land disposal facilities in California than any other State in the country. We were probably putting more wastes into those land disposal facilities than any other State in the Nation.

Four months ago we adopted regulations which banned the land disposal of five categories of hazardous waste. Those categories are cyanides, toxic metals, strong acids, PCB's, and all halogenated organic compounds.

The five categories that are covered by California regulations are simply those that represent the greatest risk to human health and to the environment when placed in a landfill.

These are the wastes that we are spending millions and millions of dollars to clean up at our Superfund sites throughout the country. These are the wastes which we never should have allowed to go to land disposal facilities.

I choke with frustration over the testimony of the first panel this morning, in which it was so clear that the difficulty in cleaning up

contaminated soils is just almost insurmountable. I doubt we can afford to pay the cost. Yet today, during this hearing, while we talk about that problem, we continue to allow the same type of materials that caused that contamination to be disposed of in land disposal facilities all over the country, including California right now.

It is unwise, to say the least, and I doubt that we are going to be able to afford ultimately to clean up these hundreds and hundreds of dump sites to the level that we need to really be protective of public health.

There are just a few key aspects of our regulatory program I wanted to highlight today.

The first is that our regulations ban only the land disposal of highly toxic wastes. We believe that there are some hazardous wastes which can be safely deposited in landfills. It is not our intent to eliminate all land disposal facilities.

Second, our regulations provide for a phaseout on land disposal that covers a 2-year period. Next month we will start with a ban on cyanides. That goes into effect on June 1. On January 1, 1984, we will ban toxic metal wastes, strong acids and PCB's. One year later we will ban liquid wastes containing halogenated organics. Finally, we will complete our schedule by July 1, 1985, when we ban sludges and solids containing halogenated organics.

The phaseout schedule is intended to allow just enough time for alternative treatment and destruction capacity to be made available. It is not the State's intent to ban land disposal if there are no available alternatives. However, at the present time we feel that a 2-year schedule is adequate to provide the capacity we need to handle all the wastes which we feel are inappropriate for land disposal.

The last key feature of our regulations is that they allow any person or company to petition for a variance from the land disposal restrictions. The burden of proof is simply shifted to the petitioner to document that their waste will not present a potential hazard to public health or the environment when placed in a land disposal facility.

Our landfill regulations cover landfills, surface impoundments, all kinds of deep well injection and even shallow well injection. Any company that can document that any of those techniques and the particular type of waste that they are handling will not present a potential public health threat is free to make the case and can receive a variance from our land disposal restrictions.

I want to talk a little bit about the economic impacts. There was a great deal of anxiety among California's industrial and business community when we first started our program to prohibit the land disposal of highly toxic wastes.

Many of the State's generators were concerned that new treatment facilities could not be brought on line as quickly as our schedule required. Many companies were also concerned that the cost of treatment would be two to three times higher than that of land disposal.

I believe it is fair to say now that neither of these are major concerns. During the last 18 months the State has issued seven new permits for treatment or destruction of cyanides, PCB's, toxic metals, strong acids, organic solvents, and pesticides. The State is

currently working on seven additional permits for high technology treatment facilities.

There are also several factors that have recently made alternative technologies much more economically attractive to California industries.

First, the cost of land disposal is increasing in California due to stricter State and Federal regulations. I think this is true all over the country, where we are seeing the cost of land disposal go up significantly.

Second, California now imposes a tax of $15 on each ton of hazardous waste that is disposed in the land. This tax supports our Superfund program, as well as our ongoing hazardous waste regulatory program, and that tax will go up to at least $22 a ton starting next July.

Third, several hundred of our larger waste generators in California have already been named as responsible parties in several major cleanup activities throughout the State. These companies may soon be required to pay for cleanup activities totaling more than $60 million. This is an additional incentive to find safer methods of handling their wastes.

It is clear now that for many California companies land disposal has turned out to be a very bad bargain. The cost of cleaning up our McColl, Stringfellow, and Aerojet sites may be over 100 times more expensive than it would have been to treat these wastes at the time that they were produced.

There is one unofficial estimate on our Aerojet site, which is $600 million to cleanup that site. There is no way those kinds of resources can ever be made available. Yet, that is one estimate.

It is almost important to note that in addition to helping companies avoid long-term liability and future cleanup costs, the State has also found that in some cases treatment is actually cheaper than land disposal.

The Department of Health Services in the State of California recently did an analysis on cyanide wastes, and they discovered that some companies would actually save money by having cyanides treated, rather than having them deposited in a landfill.

In all cases, the cost of cyanide treatment compared very favorably to the cost of land disposal. Here are just a few examples from facilities around the State. A comparison of $131 to dispose of a ton of drummed liquid cyanide wastes, that compares to $153 to treat those wastes and provide for permanent destruction of the cyanides. That is only $22 a ton more than the cost of land disposal. In another case we see it is only $15 a ton more. In another facility, the highest estimate, is $57 per ton more to destroy cyanides rather than put liquid cyanides in land disposal facilities.

California's experience over the last year or two I think clearly documents that our industries, our companies, both large and small businesses, are going to benefit very directly from the State's program to reduce dependence on land disposal. Our businesses will save money in the long term. They will also be assured of having future capacity for recycling, treatment, destruction and ultimately disposal.

One of the things the program does is to preserve our existing land disposal capacity. It is extremely difficult to get new land dis-

posal capacity. It is incumbent upon all of us to make sure we use that disposal capacity wisely. Only put in those wastes that we know are safe, when handled in that way. I think this will work to a major advantage to most of our companies, that we will have adequate capacity in the future.

Briefly, in conclusion, California's hazardous waste problems I don't believe are significantly different from most other larger, major industrialized States in the country. Many of the programs that we have initiated in California could be repeated in other states or attempted at the national level as well.

However, I sincerely hope today that our experience gives rise to new and even more immediate strategies for protecting the public from the threat of hazardous wastes. The real value of our experience is that it documents very clearly that poisoned land and water do not have to continue to be the unavoidable byproducts of our industrialized society.

We know of many proven, well-documented technologies that will safely treat hazardous wastes. We also know that the use of these technologies represents the safest and most expedient method of dealing with our Nation's hazardous waste problem, a problem that has already reached crisis proportions.

Mr. Chairman, the intent of Congress to protect the public from hazardous wastes can never be fulfilled as long as this country allows known carcinogens, mutagens, teratogens, and other highly toxic wastes to be dumped in the ground. I urge you and members of this committee to take action this session that will move this country away from our unwise and dangerous dependence on land disposal.

Thank you.

Mr. GORE [presiding]. Thank you very much, Mr. Stoddard. We are glad to have you here today and regret that we had to miss connections on the Tennessee hearing. We understood the reasons for that, and we are really glad to have you here today. I want to congratulate you on the work that you have done in California. It has really been an outstanding job. We will hold questions until the last two witnesses have testified.

[The prepared statement of Mr. Stoddard follows:]

TESTIMONY OF S. KENT STODDARD
FORMER DIRECTOR, TOXIC WASTE ASSESSMENT GROUP
GOVERNOR'S OFFICE OF APPROPRIATE TECHNOLOGY
STATE OF CALIFORNIA

PRESENTED TO THE
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
OF THE
COMMITTEE ON SCIENCE & TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

MAY 4, 1983

MR. CHAIRMAN, MEMBERS OF THE COMMITTEE, MY NAME IS KENT STODDARD. FOR 2½ YEARS I DIRECTED CALIFORNIA'S PROGRAM TO PHASE-OUT THE LAND DISPOSAL OF HIGHLY TOXIC WASTES AND TO ENCOURAGE THE CONSTRUCTION OF NEW WASTE TREATMENT FACILITIES THROUGHOUT OUR STATE

I APPRECIATE THE OPPORTUNITY TO TESTIFY BEFORE YOU TODAY ABOUT CALIFORNIA'S PROGRAM AND OUR SUCCESS TO DATE IN ATTEMPTING TO ELIMINATE ONE OF THE MOST SERIOUS ENVIRONMENTAL AND PUBLIC HEALTH PROBLEMS FACING THIS NATION--OUR CONTINUED RELIANCE ON LAND FOR THE DISPOSAL OF HIGHLY TOXIC WASTES.

YOU HAVE ALREADY HEARD A GREAT DEAL OF TESTIMONY CONCERNING ALTERNATIVE TECHNOLOGIES AND HOW THEY CAN BE USED TO SAFELY REDUCE, RECYCLE, TREAT & DESTROY MANY OF THE HAZARDOUS WASTES WE NOW DEPOSIT IN THE LAND. IT IS NOW TIME THAT WE CHANGE THE EMPHASIS OF THE CURRENT DEBATE ON LAND DISPOSAL VS THE USE OF ALTERNATIVE TECHNOLOGIES. WE MUST RECOGNIZE AND ACCEPT THE OVERWHELMING EVIDENCE THAT:

- FIRST, LAND DISPOSAL IS INADEQUATE FOR THE SAFE, LONG TERM CONTAINMENT OF MANY HAZARDOUS WASTES;AND
- SECOND, THAT ALTERNATIVE WASTE MANAGEMENT TECHNOLOGIES ARE FEASIBLE, AFFORDABLE & FAR SAFER THAN LAND DISPOSAL PRACTICES.

THE FOCUS OF THE DEBATE MUST NOW BECOME - "WHAT CAN WE DO TODAY TO ENSURE THAT ALTERNATIVE TECHNOLOGIES RAPIDLY BECOME THE CENTERPIECE OF OUR NATIONAL WASTE MANAGEMENT STRATEGY"?

THERE ARE MANY APPROACHES THAT CAN BE TAKEN TO REDUCE OUR DEPENDENCE ON CHEMICAL LANDFILLS. I BELIEVE THAT CALIFORNIA'S COMPREHENSIVE & AGGRESSIVE EFFORTS TO PHASE-OUT THE LAND DISPOSAL OF HIGHLY TOXIC WASTES OFFERS

STRONG EVIDENCE THAT THE TRANSITION FROM LAND DISPOSAL TO ALTERNATIVE TECHNOLOGIES CAN BE ACCOMPLISHED WITHOUT DISRUPTING THE NATIONS ECONOMY OR CAUSING ANY SERIOUS HARDSHIPS TO THE THOUSANDS OF BUSINESSES WHICH GENERATE HAZARDOUS WASTES.

IN MY TESTIMONY TODAY, I WILL TRY TO BRIEFLY SUMMARIZE THE APPROACH CALIFORNIA HAS TAKEN TO RESTRICT LAND DISPOSAL AND ENCOURAGE THE USE OF ALTERNATIVE TECHNOLOGIES. I WILL DESCRIBE A MAJOR STUDY WE PREPARED ON ALTERNATIVES TO LAND DISPOSAL, DESCRIBE HOW OUR NEW LANDFILL BAN WORKS, AND DISCUSS THE EFFECT OUR PROGRAM HAS HAD ON CALIFORNIA'S BUSINESS AND INDUSTRIAL COMMUNITY.

CALIFORNIA'S PROGRAM TO PHASE-OUT THE LAND DISPOSAL OF HIGHLY TOXIC WASTES

EIGHTEEN MONTHS AGO CALIFORNIA COMPLETED ONE OF THE MOST COMPREHENSIVE STUDIES ATTEMPTED BY ANY STATE TO DETERMINE JUST HOW MUCH OF OUR WASTE STREAM COULD BE RE-DIRECTED FROM LAND DISPOSAL FACILITIES. WE PREPARED THE FIRST DETAILED CHARACTERIZATION OF THE TYPE AND QUANTITIES OF WASTE PRODUCED THROUGHOUT THE STATE; IDENTIFIED THE TYPE OF WASTES WHICH REPRESENT THE GREATEST RISK TO HUMAN HEALTH AND ENVIRONMENTAL RESOURCES WHEN PLACED IN THE LAND: AND RESEARCHED OVER ONE HUNDRED SEPARATE ALTERNATIVE WASTE MANAGEMENT TECHNOLOGIES. THE PRODUCT OF THIS EFFORT WAS A REPORT ENTITLED: ALTERNATIVES TO THE LAND DISPOSAL OF HAZARDOUS WASTES: AN ASSESSMENT FOR CALIFORNIA.

AT THE TIME, THE CONCLUSIONS OF THIS STUDY WERE STARTLING TO BOTH THE GOVERNOR AND LEGISLATURE. WE FOUND THAT:

1. ALMOST 40% OF ALL THE HAZARDOUS WASTES PLACED IN CALIFORNIA's OFF-SITE LAND DISPOSAL FACILITIES WERE HIGHLY TOXIC AND VERY

PERSISTENT. THESE WASTES, WHICH ARE CAPABLE OF CAUSING DEATH AND SERIOUS HUMAN ILLNESS AND DO NOT DEGRADE FOR LONG PERIODS OF TIME, WERE UNQUESTIONABLY INAPPROPRIATE FOR LAND DISPOSAL.

2. IT IS TECHNOLOGICALLY FEASIBLE TO RECYCLE, TREAT, OR DESTROY AT LEAST 75% OF ALL THE HAZARDOUS WASTES WHICH WERE DISPOSED OF IN OUR CLASS 1 LANDFILLS.

3. THE ADDITIONAL COST OF RECYCLING, TREATING, OR INCINERATING HIGHLY TOXIC WASTES WOULD HAVE A MINIMAL EFFECT ON CALIFORNIA INDUSTRIES AND WAS JUSTIFIED GIVEN THE SERIOUS RISKS TO HUMAN HEALTH AND THE ENVIRONMENT.

4. MOST OF THE NEW ALTERNATIVE WASTE MANAGEMENT CAPACITY CALIFORNIA WOULD NEED TO RECYCLE, TREAT AND DESTROY ITS HAZARDOUS WASTES COULD BE DEVELOPED IN LESS THAN 2 YEARS.

AFTER 1½ YEARS OF CLOSE SCRUTINY BY THE CALIFORNIA LEGISLATURE AND THE CHEMICAL, PETROLEUM, AND ELECTRONICS INDUSTRIES, THESE MAJOR CONCLUSIONS ARE ALMOST UNIVERSALLY ACCEPTED.

TODAY, IN CALIFORNIA, THE NECESSITY OF RESTRICTING CERTAIN HAZARDOUS WASTES FROM LAND DISPOSAL BECAUSE OF THEIR TOXICITY, MOBILITY, AND PERSISTENCE IS SUPPORTED BY WIDELY DIVERSE INTERESTS AND ORGANIZATIONS INCLUDING:

- HAZARDOUS WASTE GENERATORS;
- CHEMICAL WASTE PROCESSORS;
- LOCAL HEALTH OFFICERS; AND
- PUBLIC INTEREST GROUPS.

I HAVE ATTACHED TO MY WRITTEN TESTIMONY A LIST OF OVER 30 ORGANIZATIONS COMPANIES, AND GOVERNMENT AGENCIES THAT ARE OFFICIALLY ON RECORD IN SUPPORT OF PROHIBITIONS ON LAND DISPOSAL. THIS LIST INCLUDES:

__DOW CHEMICAL;

__WESTERN OIL & GAS ASSOCIATION;

__CHEMICAL WASTE MANAGEMENT;

__NATIONAL SOLID WASTE MANAGEMENT ASSOCIATION;

__CALIFORNIA CONFERENCE OF LOCAL HEALTH OFFICERS;

__CALIFORNIA MEDICAL ASSOCIATION; AND THE

__LEAGUE OF WOMEN VOTERS.

OUR REPORT ON LANDFILL ALTERNATIVES ALSO OFFERED THREE KEY RECOMMENDATIONS TO THE GOVERNOR AND THE LEGISLATURE AS A MEANS OF DRASTICALLY REDUCING THE FOUR MILLION TONS OF HAZARDOUS WASTE THAT ARE PLACED EACH YEAR IN CALIFORNIA LANDFILLS. THOSE RECOMMENDATIONS WERE AS FOLLOWS:

1. CALIFORNIA'S REGULATORY AGENCIES SHOULD PROHIBIT THE LAND DISPOSAL OF HIGHLY TOXIC AND PERSISTENT WASTES;

2. THE STATE SHOULD ESTABLISH HIGHER FEES ON THE LAND DISPOSAL OF ALL HAZARDOUS WASTES.

3. THE STATE SHOULD ENCOURAGE THE CONSTRUCTION OF NEW ALTERNATIVE WASTE MANAGEMENT FACILITIES BY STREAMLINING THE PERMIT PROCESS AND BY PROVIDING FINANCIAL INCENTIVES FOR NEW INVESTMENTS IN ALTERNATIVE TECHNOLOGIES.

THESE RECOMMENDATIONS RESRESENT A RADICAL SHIFT AWAY FROM THE STATE'S PRECARIOUS DEPENDENCE ON LAND DISPOSAL AND MARKED THE BEGINNING OF AN AGGRESSIVE PROGRAM TO DIRECT THE MOST HAZARDOUS WASTES TO NEW RECYCLING

TREATMENT AND DESTRUCTION FACILITIES.

CALIFORNIA'S REGULATIONS TO BAN LAND DISPOSAL OF HIGHLY TOXIC WASTES

FOUR MONTHS AGO, THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES FORMALLY ADOPTED REGULATIONS WHICH BAN THE LAND DISPOSAL OF FIVE CATEGORIES OF HAZARDOUS WASTES. THOSE CATEGORIES ARE:

- CYANIDES
- TOXIC METALS
- STRONG ACIDS
- PBCs
- HALOGENATED ORGANIC COMPOUNDS

THE FIVE CATEGORIES OF WASTE COVERED BY THE CALIFORNIA REGULATIONS ARE SIMPLY THOSE THAT REPRESENT THE GREATEST RISK TO HUMAN HEALTH AND ENVIRONMENTAL RESOURCES WHEN DEPOSITED IN A LAND DISPOSAL FACILITY. THESE ARE THE WASTES WE ARE SPENDING MILLIONS OF SUPERFUND DOLLARS TO CLEAN-UP AT DUMP SITES THROUGHOUT THE COUNTRY. THESE ARE WASTES WHICH WE NEVER SHOULD HAVE ALLOWED TO BE DEPOSITED IN THE LAND.

THERE ARE SEVERAL KEY ASPECTS OF CALIFORNIA'S NEW REGULATORY PROGRAM THAT DESERVE SPECIAL ATTENTION --

FIRST: THE REGULATIONS BAN ONLY THE LAND DISPOSAL OF HIGHLY TOXIC WASTES-- NOT ALL HAZARDOUS WASTES. WE BELIEVE THERE ARE SOME WASTES WHICH CAN BE SAFELY DEPOSITED IN LANDFILLS.

SECOND: THE REGULATIONS PROVIDE FOR A PHASE-OUT ON THE LAND DISPOSAL OF HIGHLY TOXIC WASTES OVER A TWO-YEAR PERIOD STARTING NEXT MONTH.

- JUNE 1, 1983 THE STATE WILL BAN CYANIDE WASTES;
- JANUARY 1, 1984 WE WILL BAN TOXIC METAL WASTES, STRONG ACIDS, AND PCB's;
- JANUARY 1, 1985 WE WILL BAN LIQUID WASTES CONTAINING HALOGENATED ORGANICS; AND FINALLY
- JULY 1, 1985 CALIFORNIA WILL BAN SLUDGES AND SOLIDS CONATINING HALOGENATED ORGANIC COMPOUNDS.

THE PHASE-OUT SCHEDULE IS INTENDED TO PROVIDE JUST ENOUGH TIME TO ENSURE THAT ALTERNATIVE TREATMENT AND DESTRUCTION CAPACITY IS AVAILABLE BY THE TIME THE LAND DISPOSAL RESTRICTIONS TAKE EFFECT. IT IS NOT THE STATE'S INTENT TO BAN DISPOSAL IF THERE ARE NO AVAILABLE ALTERNATIVES.

FINALLY: THE REGULATIONS ALLOW ANY PERSON OR COMPANY TO PETITION FOR A VARIANCE FROM THE LAND DISPOSAL RESTRICTIONS. THE BURDEN OF PROOF IS SIMPLY SHIFTED TO THE PETITIONER TO DOCUMENT THAT THEIR WASTE WILL NOT PRESENT A POTENTIAL HAZARD TO PUBLIC HEALTH, DOMESTIC LIVESTOCK, WILDLIFE, OR THE ENVIRONMENT WHEN PLACED IN A LAND DISPOSAL FACILITY.

A COPY OF CALIFORNIA'S NEW LAND DISPOSAL RESTRICTION REGULATIONS ALONG WITH SUPPORTING INFORMATION DOCUMENTING THEIR NECESSITY, REASONABLENESS, AND ECONOMIC FEASIBILITY WILL BE SUBMITTED TO THE COMMITTEE.

THE EFFECT OF CALIFORNIA'S PROGRAM ON INDUSTRY

THERE WAS A GREAT DEAL OF ANXIETY AMONG CALIFORNIA'S INDUSTRIAL AND

BUSINESS COMMUNITY WHEN THE STATE FIRST INITIATED ITS PROGRAM TO RESTRICT LAND DISPOSAL. MANY OF THE STATE'S WASTE GENERATORS WERE CONCERNED THAT NEW WASTE TREATMENT FACILITIES WOULD NOT BE BROUGHT ON-LINE AS QUICKLY AS THE STATE SCHEDULE REQUIRED. MANY COMPANIES WERE ALSO CONCERNED THAT THE COST OF TREATMENT WOULD BE TWO TO THREE TIMES HIGHER THAN THAT OF LAND DISPOSAL.

I BELIEVE IT IS FAIR TO SAY THAT NEITHER OF THESE ARE MAJOR CONCERNS TODAY. DURING THE LAST 18 MONTHS THE STATE HAS ISSUED SEVEN NEW PERMITS FOR THE TREATMENT OR DESTRUCTION OF CYANIDES, PCB'S, TOXIC METALS, STRONG ACIDS, ORGANIC SOLVENTS, AND PESTICIDES. THE STATE IS CURRENTLY WORKING ON SEVEN ADDITIONAL PERMITS FOR WASTE TREATMENT FACILITIES.

I SHOULD POINT OUT THAT THERE ARE SEVERAL FACTORS THAT HAVE RECENTLY MADE ALTERNATIVE TECHNOLOGIES MORE ECONOMICALLY ATTRACTIVE TO CALIFORNIA INDUSTRIES.

1. THE COST OF LAND DISPOSAL IS INCREASING IN CALIFORNIA DUE TO MORE STRINGENT STATE AND FEDERAL REGULATIONS.

2. THE STATE CURRENTLY IMPOSES A TAX OF $15 ON EACH TON OF EXTREMELY HAZARDOUS WASTE THAT IS DEPOSITED IN A LANDFILL. THIS TAX, WHICH SUPPORTS CALIFORNIA'S SUPERFUND PROGRAM, WILL GO UP TO $22 A TON ON JULY 1.

3. SEVERAL HUNDRED OF THE STATE'S LARGEST WASTE GENERATORS HAVE BEEN NAMED AS RESPONSIBLE PARTIES AT MANY OF OUR SUPERFUND SITES. THESE COMPANIES MAY BE REQUIRED TO PAY FOR CLEAN-UP ACTIVITIES TOTALLING MORE THAN $60 MILLION.

IT IS CLEAR THAT FOR MANY CALIFORNIA COMPANIES LAND DISPOSAL HAS TURNED OUT TO BE A VERY BAD BARGAIN. THE COST OF CLEANING-UP THE McCOLL, STRINGFELLOW, AND AEROJET SITES MAY BE OVER 100 TIMES MORE EXPENSIVE THAN IT WOULD HAVE BEEN TO TREAT THESE WASTES AT THE TIME THEY WERE PRODUCED.

IT IS ALSO IMPORTANT TO NOTE THAT IN ADDITION TO HELPING COMPANIES AVOID LONG-TERM LIABILITY AND FUTURE CLEAN-UP COSTS, THE STATE HAS ALSO FOUND THAT IN SOME CASES WASTE TREATMENT IS ACTUALLY CHEAPER THAN LAND DISPOSAL.

IN A RECENT REPORT PREPARED BY THE DEPT. OF HEALTH SERVICES, STAFF DISCOVERED THAT SOME BUSINESSES WILL ACTUALLY SAVE MONEY BY HAVING THEIR CYANIDE WASTES TREATED RATHER THAN DEPOSITED IN A LAND DISPOSAL FACILITY. IN ALL CASES THE COST OF CYANIDE TREATMENT COMPARED VERY FAVORABLY TO THE COST OF LAND DISPOSAL.

CALIFORNIA'S EXPERIENCE DURING THE LAST YEAR INDICATES THAT OUR BUSINESS COMMUNITY WILL BENEFIT FROM THE STATE'S PROGRAM TO REDUCE DEPENDENCE ON LAND DISPOSAL. CALIFORNIA BUSINESSES WILL SAVE MONEY IN THE LONG-TERM AND WILL BE ASSURED OF ADEQUATE CAPACITY FOR THE RECYCLING, TREATMENT, DESTRUCTION AND DISPOSAL OF THEIR HAZARDOUS WASTES.

CONCLUSION

CALIFORNIA'S HAZARDOUS WASTE PROBLEMS ARE NOT SIGNIFICANTLY DIFFERENT FROM THOSE OF MOST LARGE, INDUSTRIALIZED STATES. MANY OF THE PROGRAMS WE HAVE INITIATED IN CALIFORNIA COULD BE REPEATED IN OTHER STATES OR ATTEMPTED AT THE NATIONAL LEVEL. HOWEVER, I SINCERELY HOPE THAT OUR EXPERIENCE GIVES RISE TO NEW AND MORE IMMEDIATE STRATEGIES FOR PROTECTING

THE PUBLIC FROM THE THREAT OF HAZARDOUS WASTES.

THE REAL VALUE OF CALIFORNIA'S EXPERIENCE IS THAT IT DOCUMENTS SO CLEARLY THAT POISONED LAND AND WATER DO NOT HAVE TO CONTINUE TO BE THE UNAVOIDABLE BY-PRODUCTS OF OUR INDUSTRIALIZED SOCIETY. WE KNOW OF MANY PROVEN, WELL-DOCUMENTED TECHNOLOGIES THAT WILL SAFELY TREAT HAZARDOUS WASTES. WE ALSO KNOW THAT THE USE OF THESE TECHNOLOGIES REPRESENTS THE SAFEST, AND MOST EXPEDIENT METHOD OF DEALING WITH OUR NATION'S HAZARDOUS WASTE PROBLEM -- A PROBLEM THAT HAS ALREADY REACHED CRISIS PROPORTIONS.

MR. CHAIRMAN, THE INTENT OF CONGRESS TO PROTECT THE PUBLIC FROM HAZARDOUS WASTES CAN NEVER BE FULFILLED AS LONG AS THIS COUNTRY ALLOWS KNOWN CARCINOGENS, MUTAGENS AND OTHER HIGHLY TOXIC WASTES TO BE DUMPED IN THE GROUND. I URGE YOU AND MEMBERS OF YOUR COMMITTEE TO TAKE ACTION THIS SESSION THAT WILL MOVE THIS COUNTRY AWAY FROM OUR UNWISE AND DANGEROUS DEPENDENCE ON LAND DISPOSAL.

SUPPORT FOR RESTRICTING THE LAND DISPOSAL
OF HAZARDOUS WASTES

Western Oil & Gas Association
Dow Chemical Company
AFL/CIO
Chemical Waste Management
3M Corporation
Hazardous Waste Treatment Council
BKK Corporation
National Solid Waste Management Association
U.S. EPA
California Air Resources Board
California Water Resources Control Board
California Conference of Local Health Officers
Los Angeles City Attorney's Office
Association of Bay Area Governments
California Medical Association
Environmental Defense Fund
Natural Resources Defense Council
Citizens for a Better Environment
Friends of the Earth
League of Women Voters
Environmental Health Coalition
Concerned Neighbors in Action
City of West Covina
Los Angeles County Department of Health Services
Texas A&M University
City of Simi Valley
Sacramento County Health Department
Environmental Action Foundation
ENV, Inc.
Envirite Waste Treatment Service
Bendix Environmental Research
Citizen's Clearinghouse for Hazardous Wastes, Inc.
Sierra Club
California State Grange

Mr. Gore. Our next witness is Bob Kuykendall, manager of the land pollution control division at the Illinois Environmental Protection Agency in Springfield. Welcome.

Mr. Kuykendall. I want to thank Chairman Gore and the members of the subcommittee for the opportunity to testify on the matter of alternative technologies for hazardous waste disposal.

I am Bob Kuykendall, manager of the land pollution control division of the Illinois Environmental Protection Agency. I have been with the Illinois EPA for 18 months and was previously with the USEPA office in San Francisco for 12 years.

My division currently has responsibility for control management of solid and hazardous wastes, the underground injection of wastes, the cleanup of hazardous and toxic waste sites, and ground water protection.

It can be said without question that both Illinois and the Nation are moving rapidly away from a sole reliance on land disposal of hazardous waste to alternative means of treatment and disposal. The IEPA has accelerated this movement during the last year.

We have implemented policies to reduce the disposal of liquids in landfills, strongly encourage recycling and alternative treatment, and to develop a drier technological approach to land disposal.

The agency, however, still sees the need for land disposal far into the future as one waste management tool to be used as one of last resort for waste streams that cannot be managed by any other means.

With respect to Illinois' current activities regarding land disposal and efforts to limit this method, I will briefly describe several policy and program approaches.

Our primary emphasis the last 6 months has been to significantly reduce the disposal of liquid organic solvents, special and hazardous wastes. This is a direct result of ground water monitoring efforts at Wilsonville, the Federal liquid ban flip-flop, various research articles and our strong concern that disposal liquids in landfills is simply not an environmentally sound approach.

For example, these policies have dramatically changed the proportion of wastes landfilled in the State of Illinois. In 1980, the first full year of manifesting wastes in Illinois, 82 percent of hazardous wastes were landfilled. However, last year the percentage was reduced to 34.6 percent, with other modes taking the following figures: treatment, 15.7 percent; recycle, 11.2 percent; storage, 0.1 percent; incineration, 2.2 percent, and 22.3 percent being transported out of State.

I want to mention that the full impact of certain policies to increase alternatives has not yet been realized. SCA's new incinerator in Chicago is just now coming commercially on line and should dramatically increase the incineration figures for hazardous and nonhazardous wastes.

Another disincentive to landfilling in Illinois is economic. Since April 1980 anyone disposing of hazardous waste must pay the State 1 cent per gallon or $2.02 per cubic yard. Bills introduced into the State legislature this session propose to raise this fee to four times and eight times the current level.

Because of this fee, disposal firms must charge more for landfilling, thereby giving an economic incentive to detoxification, recy-

cling or treatment processes. This economic advantage has its greatest impact on those waste streams that are most difficult to treat or has the smallest yield for recycling.

The IEPA and Illinois State Chamber of Commerce have been successfully operating an industrial waste exchange for the last 2 years. A summary of the economic savings and amounts of waste materials exchanged or recycled and not disposed of it included with my formal statement for the committee's review.

Let me add that through the waste exchange, which is costing the agency $18,000 a year to support, there is an economic savings to the company of about $421,000 with a recycling of waste exchange of about 3.2 million gallons and some 760 tons of solids in calendar 1982.

Another agency policy that affects the wastes landfilled in Illinois is the strict permitting of individual waste streams. Illinois has a three-tiered permitting system for waste. We would issue a development or construction permit; there is an operating permit that is granted, as well as being frequently denied; and there has been waste stream-by-waste stream permitting.

This permitting allows the agency to evaluate the physical and chemical characteristics of each individual waste and then deny permits for landfilling wastes that can be handled by some other process.

An example of this is the agency's denial of a number of solvent-bearing waste stream disposal permits as an incentive to recycle or incinerate the material. Individual waste stream permits which would have authorized the land disposal of approximately 50 million gallons of solvents were denied since July 1982.

Generic permits, rather than a waste stream-by-waste stream approach, have been issued to several solvent reclamation and aqueous waste treatment companies who are in compliance, while still keeping a waste stream-by-waste stream approach in place for the land disposal of hazardous and nonhazardous wastes. This should result in a more competitive posture for treatment companies versus land disposal in the marketplace.

Legislation has been introduced in the Illinois General Assembly which will prohibit the land disposal of hazardous waste by January 1, 1984. These waste streams will be identified which contain free liquids, organic solvents, both RCRA and non-RCRA listed organic solvents, and certain RCRA listed waste streams, which are considered environmentally detrimental.

Another important factor is the public posture of the agency that impacts what generators and disposal facilities make application to the agency to manage their wastes. By maintaining and publicizing—through newsletters, public presentations and other methods—the agency's position on this matter, many facilities know better than to make application to the agency for operations they feel the agency will deny.

There should be a stronger Federal role toward promotion of alternative technologies through declaration of public policy and the RCRA regulatory process. There are several definite points of disagreement with the RCRA regulatory process. One of the most basic is the RCRA exemption for small quantity generators of 1,000 kilograms per month.

Estimates of Illinois generators indicates that approximately 640 separate facilities generating hazardous waste in Illinois could send their hazardous waste to Illinois subtitle D sanitary landfills and be in full compliance with RCRA standards.

While these small quantity genrators only account for about 1 percent of the hazardous waste generated in the State, it adds up to about 630,000 gallons, or the equivalent of over 11,000 drums per year.

The agency has made its position well-known with the USEPA that the small quantity exemptions should not allow individual generators to each ship the equivalent of over 50 drums of hazardous waste to nonhazardous waste landfills which have minimal ground water monitoring systems in place and with no requirement to analyze for organic compounds or hazardous wastes.

The second major disagreement with RCRA is the apparent total reliance on synthetic liners as a containment system regardless of local soil conditions or hydrogeological conditions.

This is inappropriate and unacceptable to Illinois. We are currently following a much more conservative policy at this time. Lessons have been learned from Wilsonville and other Illinois waste sites, as well as other States.

Questions also exist on the permeability of clay soils where organic solvents and hazardous waste liquids have been disposed. Our current policy requires the following: a combination of synthetic liners which are compatible with wastes to be disposed in combination with an in situ clay having a specific range of permeability factors, generally in the range of 1 times 10 to the minus eighth centimeters per second, and a depth generally 10 feet below the synthetic liner; installation of a leachate collection system; leachate treatment; and an elaborate ground water monitoring system.

Although this may appear to some as an overkill approach, given the uncertainty of changes in RCRA land disposal requirements, the Illinois experience with clay liners and the changing liner data base, we think prudence is the safest course. The result is that liquid wastes will not be disposed in landfills, alternative approaches must be considered, and the State will start to achieve our goal of dry technology.

I want to note for the record that Waste Management, Inc. is currently modifying their Joliet ESL facility to meet the just mentioned requirements far in advance of their part B RCRA permit submittal.

The blending of hazardous wastes for secondary fuel programs is one that Illinois is currently grappling with in advance of anticipated amendments to RCRA this session. We welcomed EPA's publication earlier this year of an enforcement policy on the burning of low Btu waste streams, especially in sham operations.

This effort is a constructive first step toward filling a major RCRA regulatory gap. I expect that Illinois will have a program in place to regulate the blending and burning of hazardous wastes as fuels by spring 1984.

An additional area of concern is the burning of used oils. Illinois' efforts to plug the RCRA regulatory gap and at the same time increase the legitimate re-refining of waste oils is addressed in Illi-

nois State House bill 2246, which prohibits the burning of waste, other than used oil in an incinerator, boiler, furnace, burner, or other equipment after July 1, 1985 unless certain standards are met.

In summary, the Illinois EPA strongly encourages the Congress to give greater legislative and regulatory support of alternatives to land disposal while insuring that when land disposal is the appropriate technology that it occurs at environmentally sited and operated facilities.

Thank you.

Mr. GORE. Thank you very much.

Our final witness today is Norman Nosenchuck, director of the division of solid waste in the New York State Department of Environmental Conservation in Albany.

We are honored to have you here, Mr. Nosenchuck. We invite you to proceed.

Mr. NOSENCHUCK. Thank you, Mr. Chairman, and members of the subcommittee.

I appreciate this opportunity to testify on behalf of the New York State Department of Environmental Conservation. I request that this statement and its attachments be accepted into the record of this hearing.

I am the director of the division of solid waste of the New York State Department of Environmental Conservation. I have been the director of the DEC division of solid waste since 1979 and am responsible for the hazardous and nonhazardous solid waste regulatory program in New York State, including New York State and Federal Superfund-related activities for the cleanup of inactive hazardous waste dump sites.

The New York State Department of Environmental Conservation's policy is to minimize the volumes and types of hazardous wastes being disposed of on the land. Secure land burial, or landfilling, is not an appropriate technology for many wastes and is not the optimum technology for the disposal of others.

The Congressional Office of Technology Assessment this past March released their report entitled, "Technologies and Management Strategies for Hazardous Waste Control." This OTA report contains the following statement:

> It is preferable to permanently reduce risks to human health and the environment by waste treatments that destroy or permanently reduce the hazardous character of the material, rather to rely on long-term containment in land-based disposal structures.

EPA's continuing failure to formulate a uniform national policy to prohibit land disposal of hazardous wastes which first, are environmentally persistent; second, have high environmental mobility, particularly in a ground water/soil environment; third, are proven human or animal carcinogens; fourth, are highly toxic to humans, plants and animals; or five, possess highly hazardous physical properties, such as explosiveness or high flammability, and to force a transition to more appropriate technologies is a disservice to the American public.

It is very difficult to justify and accomplish unilateral State action to ban land disposal of toxic wastes or to require the devel-

opment of alternative treatment technologies for destruction or detoxification of hazardous wastes.

Without Federal action for appropriation national standards, stringent requirements on industry by an individual State could easily result in the loss of existing industries to other States that allow land disposal.

The management of hazardous wastes is clearly one of the most pressing issues facing the Nation today and will continue to be of significant concern for many years to come.

Therefore, considering the magnitude of this problem, its projected longevity and the concern of the public, New York State has focused its attention on two related program elements which are helping to discourage landfill disposal: First, imposition of stringent regulations on existing and future land disposal facilities; and second, fostering the development and implementation of alternative technologies by creating disincentives for the continued reliance of land disposal.

In New York State we have realized that a step-by-step approach will likely be necessary to reduce our dependence on land disposal. However, our goal must remain the phaseout of land disposal to the maximum extent feasible.

Alternative means of treatment/destruction/detoxification should be the only acceptable methods, starting initially with the most toxic organic wastes. Nearly all waste can technically be destroyed or put into a less hazardous condition using incineration, chemical processing, neutralization, stabilization, fixation, solidification, or other treatment.

Organic waste, in most instances, can be incinerated with proper air pollution controls leaving small quantities of relatively nonhazardous residuals. Many inorganic wastes can be stabilized, fixed, solidified, or otherwise immobilized to minimize the escape of inorganic pollutants.

Land disposal must ultimately be acceptable for only treatment residues, immobilized wastes and nontreatable wastes. Nontreatable wastes include soils or other materials contaminated with small quantities of chemicals, such as spill cleanup debris.

New York State has begun and will continue to pursue ways to encourage the implementation of alternative technologies. Some of our activities include long-term plans for major facilities.

At the present time, commercial hazardous waste management facilities, especially those employing land disposal, must submit 10-year development plans, which are updated annually, which delineate the development and implementation of high technology alternatives, such as incineration, neutralization, fixation or chemical detoxification, principally to minimize reliance upon land disposal. In fact, approval by the state of future hazardous waste landfills will be contingent on the applicant's implementation of his 10-year plan. Earlier you heard CECOS' description of their 10-year plan development in New York State.

The New York State Superfund law, which was enacted in July 1982, imposes a tax assessment on persons who generate, treat or dispose of hazardous waste in New York State. One portion of this law assesses a tax on waste generators which varies from $2 per ton for waste generated in New York State but incinerated on the

site where the waste is generated, to $12 per ton for wastes that are land buried. A $9 per ton tax is levied for wastes generated in New York State and treated and disposed of, exclusive of land burial, at a location off the site of generation.

As recommended by the department, the lowest assessment applies to incineration as an acknowledgement by the State that the implementation of such technology is desirable and has less short- and long-term environmental and health risks.

The environmental regulatory program fee bill, which was adopted in March 1983, provides partial funding for the Department of Environmental Conservation's hazardous waste regulatory program by assessing fees on hazardous waste treatment, storage or disposal or hazardous wastes. The fees range from $5,000 for waste incinerators to $100,000 for commercial landfills. In other words, the lowest fee is assessed to incineration facilities, as in the case of the State superfund tax assessment.

We intend to develop regulations to ban the landfilling of certain hazardous wastes. Thus far, the State has been able to impose permit conditions that have limited the land burial of certain generic wastes, such as highly flammable wastes, radioactive isotopes, shock sensitive or pyrophoric substances.

Additionally, we plan to prohibit incinerable hazardous wastes from secure chemical landfills using permit conditions, and we intend to do this by April 1, 1984. Furthermore, we have required the segregation of incompatible wastes, such as subcells within a landfill, with discrete leachate collection and limitation of liquids in landfills.

Earlier Ms. Jane Bloom described the waste exchange program in place in New York State through the Northeast Industrial Exchange, located in Syracuse, N.Y. They publish a catalog of wastes wanted and wastes available and serve nine States.

The New York State Environmental Facilities Corp., which is a public benefit corporation, puts generators and users together. This corporation serves as a broker and does not take possession of wastes.

I must also bring to your attention what I consider to be a major unaddressed question: The ability of the States to adequately administer the Federal hazardous waste management program.

EPA wants to phase out their program support to the States. New York State has not accepted phase I interim authorization of its hazardous waste management program because there is no commitment by the Federal Government to pay its share of the program costs. Nevertheless, we do expect to seek full authorization for our hazardous waste management program now that the State has enacted a hazardous waste program fee under State law.

However, why should New York State and other States that have no accepted phase I interim authorization be penalized by EPA, as EPA is now proposing, by unilaterally amending their RCRA subtitle C grant allocation formula for State program grants?

I have covered this concern in my expanded remarks, which are attached. It is my opinion that any changes to this grant allocation formula be discussed in the public arena. Funding States at the old or existing grant allocation formula should be continued until these public hearings are held.

Thank you, Mr. Chairman, for giving me this opportunity to present our views and concerns.

[The prepared statement of Mr. Nosenchuck follows:]

EXPANDED COMMENTS SUBMITTED FOR THE RECORD

BY

NORMAN H. NOSENCHUCK, P.E.,
DIRECTOR, DIVISION OF SOLID WASTE
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AT

UNITED STATES HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

PUBLIC HEARING

ON

ALTERNATIVE TECHNOLOGIES FOR HAZARDOUS WASTE DISPOSAL

MAY 4, 1983

At the present time, New York State's efforts to encourage utilization of alternative technologies and to discourage landfill disposal is as follows:

(1) State Regulations of Landfill Design and Operation

During the last several years numerous groundwater contaminating land disposal sites in New York State have been discovered and investigated demonstrating the need for very stringent design and operation control. New York State's climatological conditions foster the generation of significant quantities of leachate, while our natural hydrogeological conditions make it relatively easy for migrating leachate to come in contact with the groundwater environment. These natural conditions in conjunction with inadequate design and operating standards of the past help create long-term groundwater pollution.

Due to past groundwater pollution caused by hazardous waste land disposal and the resultant social, environmental and economic damages, New York State considers land disposal of hazardous waste, even in secure cells, as the disposal method of last resort. We have been encouraging industry to minimize reliance upon land disposal; however, we realize that secure landfills are necessary and desirable interim solutions until practicable alternatives can be implemented. Briefly, I would like to list some of the program elements which the Department of Environmental Conservation currently employs to encourage utilization of alternative technologies for hazardous waste management and to discourage landfill disposal.

(a) New York State Regulations

Since 1977, New York State's solid waste management regulations (6 NYCRR Part 360), which also regulate hazardous waste, have contained stringent design and operating standards for secure landburial facilities. Each facility has unique characteristics which usually require the imposition of special construction and operation permit conditions whose purpose it is to prevent the migration of generated leachate into groundwater during and following the active life of the facility. These regulations have meant significant increases in landfill construction and operating costs and have thus contributed to a rise in the price of land disposal. Although land disposal of wastes is presently cheaper than incineration, the economics have been changed such that major New York State commercial waste management firms have made or are preparing to make major commitments in alternative technologies.

(b) Limiting Landburial of Liquid Wastes

New York State has limited landburial of bulk and containerized liquid wastes, including organic liquid wastes which are incinerable. Landburial of liquids has been strictly limited through the State regulatory permit process. New York State does not allow the land disposal of hazardous liquids and has not done so for the past five years. Therefore, the only hazardous wastes that are currently landburied in New York State are those which are generally characterized as solids or sludges.

(2) On-Site Environmental Monitors

New York State requires On-Site Environmental Monitors at hazardous waste management facilities that have a potential for serious or irreversible damage to the environment or that threaten public health. These environmental monitors are required beyond our routine inspections and monitoring procedures. We have certain criteria for determining which facilities require this additional monitoring--but, due to their significance, the following types of facilities always require environmental monitors:

(i) Commercial secure landburial;

(ii) Commercial hazardous waste process incinerators; and,

(iii) Commercial processing/treatment facilities which handle acutely toxic wastes as defined in State regulations.

The New York State Department of Environmental Conservation provides staff and equipment for monitoring, and each facility operator with On-Site Environmental Monitor requirements is required to fund the cost of the entire monitoring operation. EPA would be well advised to follow New York State's lead on this and make this a national requirement, especially for commercial secure landburial facilities.

(3) Encourage Utilization of Alternative Technologies

We have realized that a step-by-step approach will likely be necessary to reduce our dependence on land disposal for hazardous waste. However, our goal must remain the phase-out of land disposal to the maximum extent feasible. Alternative means of treatment/destruction/detoxification should be the only acceptable methods, starting initially with the most toxic organic wastes. Nearly all waste can technically be destroyed or put into a less hazardous condition using incineration, chemical processing, neutralization, stabilization, fixation, solidification, or other treatment.

Organic waste, in most instances, can be incinerated with proper air pollution controls leaving small quantities of relatively non-hazardous residuals. Many inorganic wastes can be stabilized, fixed, solidified, or otherwise immobilized to minimize the escape of inorganic pollutants.

Land disposal must ultimately be acceptable for only treatment residues, immobilized wastes, and non-treatable wastes. Non-treatable wastes include soils or other materials contaminated with small quantities of chemicals, such as spill cleanup debris.

New York State has begun and will continue to pursue ways to encourage the implementation of alternative technologies. Some of our activities include:

(a) Long-Term Plans for Major Facilities

At the preset time, commercial hazardous waste management facilities, especially those employing land disposal, must submit ten-year development plans which delineate the development and implementation of high technology alternatives such as incineration, neutralization, fixation or chemical detoxification, principally to minimize reliance upon land disposal. In fact, approval by the State of future hazardous waste landfills will be contingent on the applicant's implementation of his ten-year plan. Although the requirements for ten-year plans originated with the Department of Environmental Conservation decisions on two specific applications for additional secure chemical landfills, State legislation in 1982 included new statutory powers for the Department which allows it to adopt regulations on long-term plans for hazardous waste management facilities.

(b) State Superfund (Chapter 857 of Laws of 1982)

The State Superfund imposes a tax assessment on persons who generate, treat or dispose of hazardous waste in New York State. One portion of this law assesses a tax on waste generators which varies from $2.00 per ton for waste generated in New York State but incinerated on the site where the waste is generated, to $12.00 per ton for wastes that are landburied. A $9.00 per ton tax is levied for wastes generated in New York state and treated and disposed of

(exclusive of landburial) at a location off the site of generation. As recommended by the Department, the lowest assessment applies to incineration as an acknowledgement by the State that the implementation of such technology is desirable and has less short and long term environmental and health risks than landburial of hazardous wastes.

(c) Environmental Regulatory Program Fee Bill (New Article 72 of Environmental Conservation Law, Title 4 Hazardous Waste Program Fee

This new State law, adopted in March 1983, provides partial funding for the New York State Department of Environmental Conservation's hazardous waste regulatory program by assessing fees on hazardous waste treatment, storage and disposal facilities. Under this new law an annual fee is assessed on all facilities which must have a State permit for the treatment, storage or disposal of hazardous wastes. These fees range from $5,000.00 for hazardous waste incinerators to $100,000.00 for commercial hazardous waste landfills. In other words, the lowest fee is assessed to incineration facilities as in the case of the State Superfund assessment.

(d) State Selective Ban on Land Disposal of Hazardous Waste

Now that fee legislation for the State hazardous waste regulatory program is in place, the New York State Department of Environmental Conservation intends to develop regulations to ban the landfilling of certain wastes if State legislation is not enacted. Thus far, New York State has been able to impose permit conditions that have limited the landburial of certain generic wastes such as:

highly flammable wastes; radioactive isotapes; explosives; and shock sensitive or pyrophoric substances. Furthermore, we have required the segregation of incompatible wastes (i.e., subcells within a landfill with discrete leachate collection) and limitation of liquids in landfills. However, New York State has not reached its objective since we believe that secure landburial is not the appropriate technology for many wastes and not the optimum technology for the disposal of other wastes.

The New York State Department of Environmental Conservation would support an effort by the U.S. Environmental Protection Agency to promulgate a ban on the land disposal of certain hazardous wastes. Generally, we believe that waste candidates for such a ban are those chemicals which (a) are environmentally persistent, (b) have high environmental mobility, particularly in a groundwater/soil environment, (c) are proven human or animal carcinogens, (d) are highly toxic to humans, plants and animals, or (e) possess highly hazardous physical properties, such as explosiveness or low flash points.

(4) New York State Environmental Facilities Corporation - Industrial Materials Recycling Act Program (IMRA)

The New York State Environmental Facilities Corporation, (EFC) a State public benefit corporation, is currently implementing several programs principally dealing with the reuse, recycling and reclamation of hazardous waste, and providing industrial financing. An outline of these hazardous waste management activities is given below:

EFC IMRA PROGRAMS

(a) Waste Exchange Program

1. Funding of a portion of the Northeast Industrial Waste Exchange's (Syracuse, NY) catalog of wastes wanted and wastes available.

Passive Exchange - Catalog System

States Served - NY, NJ, PA, ME, MA, CT, RI, NH, MD

2. Active Exchange - EFC

EFC staff puts Generators and Users Together - Serves as "Broker" EFC Does Not Take Possession of Wastes

(b) Technical Assistance to Industry

For: Waste Stream Analysis

Source Reduction

Waste Exchange

Energy Recovery

Treatment & Disposal Alternatives

Regulatory Assistance

(c) Preliminary Handbook of Quantities of Waste in NYS, and Technical and Economic Feasibility of Recycling Them

(Note: EFC will share the New York State Department of Environmental Conservation's report on hazardous waste which will be a compilation of one year's Hazardous Waste Manifest System data.)

(d) Industrial Financing

Lowest Interest Loans to Qualified Companies for Industrial Hazardous Waste Management Facilities

The loans are financed from the proceeds of special obligation revenue bonds of EFC, the interest on which is generally exempt from New York State and federal income taxes, thereby resulting in substantially lower interest rates on loans made by EFC.

A very important feature of the program is that several environmental projects at one or more plant sites in New York State can be financed through a single bond issue. The bonds are not obligations of the Corporation or the State of New York and are issued on an individual company basis.

(e) Alternate Technologies Research

EFC supports and encourages research into the following technical areas that could provide information and additional alternatives for treatment and disposal of hazardous wastes.

- Incineration
- Source Reduction
- Solvent Recovery
- Use of Pickling Liquors in Wastewater Treatment Plants Fly Ash and Cement Dust

(5) Concern about EPA's Proposed National Uniform Manifest Regulations

EPA plans to issue, sometime soon, their National Uniform Manifest Regulations. I have not seen these final regulations, but I know enough about these regulations to be concerned.

Representatives of New Jersey, Pennsylvania, Texas, California, Illinois, Michigan, and Ohio were contacted about two months ago by New York State. Of the seven states called, two of them

do not have an actual manifest tracking system (Ohio and Texas). The other five states do have tracking systems as we do in New York State, and are as concerned about the proposed National Uniform Manifest regulations as we are.

Every state that tracks its hazardous waste, except California, has a shared concern. This concern is that under the proposed EPA National Uniform Manifest System we will only be able to track wastes generated in the state where the wastes originate. Those wastes generated out-of-state shipped into New York State will not be able to be effectively tracked under the National Uniform Manifest System, since the generator will utilize the generator state's form. The generator state will determine the distribution of the manifest copies. Therefore all those New England states that ship wastes into New York State will not be required to notify us of the initiation of any hazardous waste shipment into New York State. Each state with a tracking system has exactly the same concern and would rather see no National Uniform Manifest System than one which allows us to track less wastes than we currently do. Therefore, EPA should change their generator requirements as follows:

Generators shipping wastes out-of-state must conform to the distribution requirement of both the generator and disposal states.

This addition will allow New York State and those other states tracking hazardous wastes to regulate the same wastes currently regulated under the individual state systems. The other alternative would be to go to a two-part manifest form, which would allow sufficient

copies for both the generator state and the disposer state to be notified of the shipment.

Without the above described information change, I have been advised that New Jersey, Pennsylvania, Illinois, Michigan and, in our case, New York State would oppose a National Uniform Manifest Form.

In addition to the above described concerns there are a number of other minor changes that would certainly make the National Uniform Manifest Form much more adaptable to state programs. The primary additional change, on which three different states commented, is the need to separate the ID number from the document number by either a line or a dash so that the generator ID number remains unique and separated.

EPA is aware of our concerns. We do not know how EPA has resolved them.

(6) EPA's Proposed FY 1984 RCRA Subtitle "C" Grant Allocation Formula for State Program Grants

EPA's proposed FY 1984 RCRA Subtitle "C" Grant Allocation Formula severely penalizes states that have not received interim authorization but are working toward final authorization of their hazardous waste management programs. In the case of New York State, this means that the program grant to the State, instead of being $2,500,900, would now be $2,013,100, a loss of $487,800. EPA is currently as, we understand it, playing around with the "mathematical modelling" of this revised grant formula.

I understand that the national data base that was used by EPA in their draft grant allocation formula is generally recognized to

be incomplete and, in some instances, inaccurate, even by EPA (see the recently published Congressional Office of Technology Assessment (OTA) report dated March 1983, entitled: Technologies and Management Strategies for Hazardous Waste Control," Page 8).

The changes in the EPA draft FY 1984 Subtitle "C" Grant Allocation Formula are significant. They should have been fully discussed with state representatives at full public hearings. Funding states at the "old" grant allocation formula should be continued until these public hearings are held.

Mr. GORE. Thank you very much. That was a terrific statement. In fact, all three of these statements of this panel I think have been terrific. I only wish they had come a little earlier in the day. I am sorry the hearing has gone as long as it has, but with these votes on the floor it has been difficult.

We are going to widely disseminate this hearing record, and I hope that it will have a substantial impact on policy in this area. We are going to pay particularly close attention to the three statements we have just heard. You have been at the front lines and you have brought us excellent reports from those front lines. I find these statements very, very impressive.

I would like to recognize Congressman Durbin.

Mr. DURBIN. Thank you very much.

I assume from your testimony that you are all fairly familiar with or conversant with the approaches that are being used by other States in the same field.

Would any of you like to comment on what you consider to be the most progressive State, by general objective standards, that has been able to get through their legislature the type of legislation in relation to landfill.

Mr. GORE. Aside from these three?

Mr. NOSENCHUCK. What I would say, with all due respect, Mr. Congressman, I think you are looking at the three most progressive States—and I mean this sincerely—in this area. We meet among ourselves. I have met with Mr. Stoddard and Mr. Kuykendall. We talk about our programs. We share our experiences through the Association of State and Territorial Southwest Management Officials. So, the States, working together, are sharing their experiences.

However, as I pointed out, it is EPA who has failed to provide the national impetus to permit us to move ahead much more rapidly. When we try and do something in New York State what industry tells us is, "Norm, why are you moving ahead? Why are you so much in front of EPA? Stay back. Why not even adopt what EPA has adopted? Why promote and promulgate your own regs?"

You know what happened when EPA lifted the ban on liquids and landfills? Just like other States who had adopted their regulations, they would have been dumping them. You know the deal

where they got caught in the dead of night and then they got that public outcry, which they never expected.

The American public, I submit, is thoroughly disgusted with what has been happening at EPA so far, and I hope there is a change.

Mr. DURBIN. I guess the reason I brought that up, and I wasn't trying to be facetious or put you on the spot, but you make a good point—it has been made before in our hearings in Tennessee—that if we don't do something on a national basis, the States will finally decide that they are going to stand up to the problem and do something about it, run the risk of running industry out to go to the easy States.

Here we sit in a capital where we are told day in-day out, keep your nose out of it, Federal Government, we want to do it at the State and local level. This seems like the area that just argues and begs for the opposite approach.

Mr. NOSENCHUCK. Yes, sir. We want a good oversight role by EPA. We want pragmatic, acceptable, rational, uniform national standards. We also want the recognition that this is a serious problem.

It has only been since 1978, with the unfortunate event of Love Canal, when people started seriously considering hazardous waste as something that is pretty darn dangerous, not too good. This is really the new kid on the block, this particular program. It is not as mature as the water and the air programs.

The hazardous waste program at the national level and at State levels primarily is in its infancy. We want a strong EPA oversight role. The States have the responsibility, but we want a good working partnership.

Mr. KUYKENDALL. Mr. Chairman, there is one comment I would like to make that I think warrants the committee's attention, as well as other congressional committees. As we are sitting here talking about land disposal, we are, at the same time, going around cleaning up various Superfund sites or State abandoned or orphaned sites.

The issue that I am trying to focus on is in Illinois we had on January 24 six hazardous landfills that were permitted. We now have four. We are just now starting to cleanup three or four of the Superfund-listed sites using Federal Superfund dollars, as well as State hazardous waste fund moneys.

As we have seen the phasing out of certain landfill capacity, there seems to be a strong argument that we should look at the issue of either in-place treatment or fixation of abandoned chemical sites. Or do we in fact use the present permitted capacity to dispose of this material? Or should we reserve our currently State-permitted sites for present and future waste generation?

Mr. DURBIN. Mr. Kuykendall, perhaps you could mention a few words about Wilsonville, which is in my congressional district, and I think has been the focus of some national attention in this area. As I understand it, they are presently in the process of removing the contaminants from that site. Perhaps you could give us a report on what you are finding in that process.

Mr. KUYKENDALL. When I first joined the agency in Illinois, all of a sudden, I realized that Wilsonville was mine, at least to take a

look at. As you are aware, the company is under local court order to exhume all waste disposed at that site. There are about 80,000 to 90,000 drums of waste there.

That order was filed in March of this year. The agency had worked quite closely with SCA starting in the fall of 1981 to develop a cleanup plan that was filed and approved by the court.

We generally have people onsite once or twice a week. The company's estimate of what it is going to cost is about $25 million and generally they say about 3 to 4 years. We think it is going to take a lot longer than that and probably will cost more.

The company is currently doing a responsible job in cleaning up. There have been some site cleanups around the country, but none to the extent and degree of removing 80,000 drums of material that have been placed helter-skelter in trenches.

We had some initial concerns about their first-line supervision of their crews that worked down in the various trenches. Starting last August, my agency and my division and the State geological survey have spent a lot of time and resources and money trying to do a retrospective study of what did or did not happen at Wilsonville, so we could learn.

Something happened. We don't know whether it was a construction error. It is just the issue of solvents leaking through sand lenses to the clay liner. We have drilled lots of holes there, we have wells there, the place is literally blanketed.

The company, as I said, is responding in a fully cooperative, responsible manner. They had some initial problems on drum management. They have taken all of our suggestions to heart and have corrected situations.

One trench they are just finishing. It is known as trench 24. Most of the materials that they are taking out of there that are liquid are being sent to various treatment firms in Chicago, particularly ChemClear Corp.

Mr. DURBIN. Is that for a recycling process?

Mr. KUYKENDALL. Some is recycling, some is heavy metals removal, some is other solidification——

Mr. DURBIN. I hate to interrupt you, but I have a few more questions. How long has this technology been available? What I am driving at is could they have sent those drums there in the first place?

Mr. KUYKENDALL. I can't speak for what existed in Illinois in 1976. I can speak for the last couple of years. The technology has been there. As I talked with three or four firms, there is one solvent company, the Safety Clean Corp., which has an annual capacity of about 18 million gallons and they are currently at about 30 to 40 percent of capacity.

There is another treatment company where they have a capacity of about 25 million gallons, and they are right now putting through their process particular metals and other waste waters, about 3 million gallons.

Mr. DURBIN. Have you been able to determine whether or not what you found, the retrospective, has had a direct impact on the water supplied in the village of Wilsonville and the surrounding area?

Mr. KUYKENDALL. The extent of what we found in the ground water monitoring, I don't think we can clearly state that there has been a drinking water supply issue. Two or three wells that we had initially sampled we were finding various organic solvents which the agency had permitted. They are in the percent by volume.

As I indicated in my testimony, we have found the same types of organic solvents at the U.S. ecology facility in Sheffield. We found that they are in the 1 to 10 part per billion range.

The major predicament we have is, once you find something, there is the expectancy in the public that you can tell them what it means and you can do something about it. That data base doesn't exist in terms of environmental health or toxicology for a lot of the compounds we deal with.

Mr. DURBIN. The soil contamination, have you found evidence that you are going to be dealing with—I think our testimony earlier with Congressman Volkmer said it would cost them $1 billion to clean up that dioxin mess in Missouri.

Have you found that kind of contamination in the Wilsonville area?

Mr. KUYKENDALL. No, we haven't. The company is estimating their cleanup project is going to run about $25 million. We think it is going to likely cost more than that.

Mr. DURBIN. I think we lucked out in one respect. SCA is a big company. It can't disappear.

Mr. KUYKENDALL. Well, you and I are paying half of it.

Mr. DURBIN. A court order means something when you are dealing with a company that doesn't disappear on you overnight.

Mr. KUYKENDALL. The company has opened up the corporate checkbook. Generally, anything we want to require of them, they do.

Mr. DURBIN. Thank you, Mr. Chairman.

Mr. GORE. I get the impression, being somewhat familiar with that company myself, that they are really trying hard to do a model job at Wilsonville. Is that the impression that you get?

Mr. KUYKENDALL. Yes.

Mr. GORE. I think they are really doing their best.

Mr. DURBIN. Mr. Chairman, a point Mr. Volkmer made was that it started off as a model landfill. Now it is going to be a model cleanup.

Mr. GORE. Congressman Volkmer?

Mr. VOLKMER. I would like to commend you, too, on your statements and to see where the States are going.

Mr. Nosenchuck, I was very interested in the part of your statement where you concern yourself with the State itself being so strict that industry decides to relocate. I assume from that we should emphasize the need for stronger Federal requirements, so they are uniform throughout the country. Is that correct?

Mr. NOSENCHUCK. Yes, sir, Mr. Volkmer. What is happening, as I mentioned earlier, is when we were developing some of our requirements, industry in effect came to us and asked us why we were so far out in front. They did talk to our legislature and said if these things were passed or if the department published or promulgated its regulations, they would threaten this.

One of the things that we did, which I thought most every other State should do, is the development of these 10-year high technology plans. These are revised annually. Incidentally, CECOS is one of the facilities. The other one is SCA, Chemical Services, and they both are doing a very fine job.

We are finding now, from what they tell us, that with our fee structures, our tax assessments, and what have you, that material, instead of going to them, is going to other places that is accepting land burial.

It is very difficult to ask an industry to spend the money to develop the facilities. I think CECOS pointed out some of the money that they are talking about. It is very difficult for us to require that if they can show us—we look at all their confidential data, which we hold very tight on everything, including their fiscal ability; we are right in there with them on that. It is very difficult for us to say you must do this if they can show us that the market isn't there, it is going to other States, and they are liable to go bankrupt.

Mr. VOLKMER. Are you saying that the industry would move it from the State of New York to a State like Pennsylvania or New Jersey or Massachusetts, where they could put it in the ground?

Mr. NOSENCHUCK. Yes; that is correct. Industries will consider, instead of a plant expansion, plant addition, or even locating it in a State like New York, which has taken this attitude, going somewhere else, where the cost of disposal is going to be much less.

Land burial is generally the cheapest method of getting rid of waste.

Mr. VOLKMER. Short term.

Mr. NOSENCHUCK. Short term, absolutely short term. In the long term, it is going to be in the untold billions of dollars. In the research needs, somebody raised the question, what type of research would EPA be involved in?

One of the most critical areas in connection with cleaning up inactive hazardous waste sites is the entire issue of how clean is clean. There is no answer to that yet.

Mr. VOLKMER. I agree on that. I think Mr. Kucera, from my State, was bringing up questions of further research by EPA. That is part of it, also, as far as dioxin, et cetera.

Generally, would you say a general statement for this—and anyone on the panel who wishes to can add to it or subtract from it—would be, could we, in the Federal, within the time frame to remit it to be done, say 3 or 4 years, prohibit all landfill for all the most toxic wastes, and also for all those that can be treated through an alternative process or recycle?

Do you agree generally with that?

Mr. NOSENCHUCK. Yes, sir. I agree with that statement. Again, as each one of us has pointed out, landfills are going to be necessary to handle certain types of wastes and certain types of residues.

You have to force the expenditure by industry of alternative technologies, and the only way you can do that, in my opinion, is to have uniform national requirements. So you are going to have to have the same type of treatment methodology in this part of the country or in that part of the country. That is correct.

Mr. STODDARD. I would have one comment to make, and that is on the timeframe. I know when we got into our project we looked at a timeframe of 3 to 5 years to try to accomplish this. We agonized over the economic considerations of how much is this going to cost in additional dollars to both large and small businesses.

I don't think we have that luxury any longer. The magnitude of cost that we are looking at right now, we have a $1.6 billion superfund which will never come close to meeting the list of priority sites. California has a $100 million superfund program, which will certainly go broke.

I think every year we wait to take decisive action to restrict what we know are the highly toxic wastes, we are simply buying a liability down the road that we know will be 100, or 1,000, or 10,000 times greater than the burden we would put on industry right now to move more quickly toward the use of better, safer alternatives.

I would certainly argue that we need to go just as fast as we possibly can.

Mr. KUYKENDALL. Illinois would concur with that statement.

Mr. STODDARD. If I could, I would like to add one thing that might be of interest for the record.

We took the worst case cost analysis on our landfill phaseout program. It came out that if all the costs were passed along to the consumers in California, it would cost every person in California 75 cents per year more to have all highly toxic waste treated, incinerated, destroyed, right up to the state-of-the-art technology, 75 cents per person per year.

Mr. VOLKMER. In your definition in California of highly toxic wastes, were those only those that were being manufactured or processed in the State of California?

Mr. STODDARD. Yes; California is a bit of an island. We don't have the boundary problems of other States. Arizona and Nevada are very small generators, so almost all of our wastes are produced and stay in California.

Mr. KUYKENDALL. Our data shows that in Illinois basically the amount of material that is coming in from other States equals the amount of waste that goes out of Illinois to other States. That is based on calendar 1982 data.

Mr. VOLKMER. None of you really believe that if we do come down, which I am sure industry in many areas, as we say, is very hard, in your opinion of the analysis of it, that the costs to it in the long run would probably be very little?

Mr. NOSENCHUCK. Yes.

Mr. VOLKMER. Just taking those highly toxic wastes.

Mr. NOSENCHUCK. Absolutely. I don't expect that this would be any enormous burden whatsoever.

Mr. STODDARD. I think the issue is what we are taking away is an unacceptable practice. Whichever way we cut it right now, what we are dealing with is that for highly toxic, persistent, carcinogenic, mutagenic, and tetratogenic wastes there is no way that land disposal can continue to be an acceptable alternative.

Mr. VOLKMER. I think you have already pointed out, Mr. Stoddard—I believe it was you—the Stringfellow, the aerospace site, that it had been less costly for them to do it the right way.

Mr. STODDARD. Yes, one hundredfold less expensive.

Mr. VOLKMER. Thank you, Mr. Chairman.

Mr. GORE. Thank you.

I might add that the Commerce Committee is about to consider the RCRA reauthorization bill, which will include an amendment banning landfill disposal of certain wastes in the category that you are focused on. I hope that the record of this hearing will provide some support for that measure. There may be some disagreement about it.

Mr. VOLKMER. Mr. Chairman, along that line, if the EPA and RCRA haven't moved fast enough—they are moving awful slow—maybe you can specifically say dioxin, with its proper term, specifically also is considered one of those toxic wastes. I think it is fairly well recognized as such.

Mr. GORE. A very good point.

I would like to again thank the witnesses on this final panel for excellent testimony.

Did minority counsel have questions?

Mr. RHEEM. No questions, Mr. Chairman.

Mr. GORE. Thank you very much.

The hearing will stand adjourned.

[Whereupon, at 2:10 p.m., the subcommittee adjourned.]

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